ELECTRICAL REVIEW
AND
WESTERN ELECTRICIAN

VOL. LVIII, No. 5. CHICAGO, SATURDAY, FEBRUARY 4, 1911. ISSUED WEEKLY.

BY THE

ELECTRICAL REVIEW PUBLISHING COMPANY

CHARLES W. PRICE, President and Treasurer.
A. A. GRAY, General Manager. H. S. TUTHILL, Secretary.
C. W. FORBRICH, Assistant Treasurer.

PUBLICATION OFFICE: MARQUETTE BUILDING, CHICAGO

EASTERN DEPARTMENT . . . . . 13 Park Row, New York.
E. E. Wood.
EUROPEAN OFFICE . . . . . 42 Old Broad Street, London, E. C.
Henry W. Hall, Manager.

CHARLES W. PRICE.....Editor-in-Chief
A. A. GRAY.....Managing Editor
MORTON GITHENS LLOYD.....Technical Editor
F. H. BERNHARD.....Associate Editor
HOWARD EHRLICH.....Associate Editor
C. H. SEAVER.....Associate Editor

SUBSCRIPTIONS.

One Year, United States	$3.00
One Year, Canada	4.00
One Year, Foreign Countries	6.00
Single Copy, 10 cents. Back numbers, beyond one month, each	.25

Entered as second-class matter, November 7, 1908, at the Post Office at Chicago, Ill., under the Act of March 3, 1879.

CONTENTS.

EDITORIALS—
Electrification at Boston.....217
Water-Power Development.....218
Twenty-Three Years of Electric Railways.....218
Prompt Publication of Technical Papers.....219
The Value of Electrical Shows.....219
Lightning and Forest Preservation.....219
The Market for Electrical Energy.....220
Joint Electrical Meeting in Chicago.....220
H. Ward Leonard.....221
American Electric Railway Association Dinner.....222
New York Section Organized.....222
1912 National Electric Light Association Convention May Go to Portland, Ore.....222
Toronto Section Meeting.....222
Chicago Subway Plan.....222
Electricity in a Modern Hotel.....223
Minneapolis Electric Show.....228
Logical Basis for Valuations of Interurban Street Railways.—By C. G. Young.....231
Report on Railroad Electrification at Boston.....237
Elements of Power Station Design.—XXI.—By W. B. Gump.....238
Minneapolis Electric Club.....241
Changes in Pacific Power & Light Company.....241
Changes in Electrical Rules, New York City.....241
The English Telephone Situation.....242
National Independent Telephone Convention in Chicago.....243
New York-Denver Long-Distance Line Practically Complete.....243
Wireless Station in South Brooklyn.....243
New Wireless Stations.....243
Wireless Changes at Trinidad.....243
Wireless in Africa.....243
Compulsory Wireless in Italy.....243
Telephones in Canadian Mines.....243
Platinum in Texas.....243
Wireless Station in Dalny.....243
Alternating-Current Motor-Driven Elevators.—By George J. Kirschgasser.....244
Electric Plant of Kingfalfa Mills, Nebraska City, Neb.....247
Electric Power Operates Concrete Mixers in England.....247
Joint Meeting in St. Louis.....247
Electric Steam-Boiler.....247
Cotton Mill Electrifies.....247
FINANCIAL REPORTS OF ELECTRICAL COMPANIES.....248
AMONG THE CONTRACTORS AND SUPPLY MEN.....248
Proposed Tariff Reductions.....248
QUESTIONS AND ANSWERS.....249
Marion Municipal Plant Discontinued.....249
NEW ELECTRICAL AND MECHANICAL APPARATUS AND APPLIANCES.....250
Chicago Automobile Show.....255
CURRENT ELECTRICAL NEWS.....256
PUBLIC SERVICE COMMISSION NEWS.....256
RECORD OF ELECTRICAL PATENTS.....262

Copyright 1911 by the Electrical Review Publishing Company.

ELECTRIFICATION AT BOSTON.

The report of the Joint Board on Metropolitan Improvements, regarding electrification of the steam railroads entering Boston, has been made to the Massachusetts Legislature, as noted on another page of this issue. A bare majority of the Board opposes any legislation, while a minority favors some action to hasten electrification. With a single exception, the commissioners whose experience lies in the transportation field are practically at one on behalf of electricity. The entire Board of Railroad Commissioners and a majority of the Boston Transit Commission incline toward the electrical solution. It is certainly difficult to see why the two other Commissions were ever called into the case, for their qualifications to pass upon so technical a question as this are anything but apparent from the duties imposed upon their organizations under normal conditions.

If the success of electricity everywhere else in human affairs is any criterion, electrification is bound to come in steam railroading sooner or later. When a sufficiently large portion of a railroad system of trunk-line standards is in operation by electric power we fancy it will not be so difficult to convince people that the steam locomotive is economically doomed. It is unquestionably true that the cost of electrifying will be heavy for many years to come; but who can really measure the economies which complete electrification is capable of securing? Since the notable paper of former Vice-President Wilgus, of the New York Central Lines, before the American Society of Civil Engineers, a couple of years ago, the opinion has been general that electricity will, in the long run and with complete engine-stage equipment, be found somewhat less costly than steam, when all the facts are taken into account. When the real facts come out as to the costs on the New Haven between New York and New Haven, and on the New York Central between the Grand Central and Croton or White Plains, electrical engineers will be very much surprised if the results do not show that electric service is better than steam financially as well as from the operating and public points of view. It is quite possible that if the trunk lines entering Boston should be electrified first to distances of fifty or sixty miles, there would be a different story on the hypothetical balance sheets. Finally, if there should be necessary a slight increase in suburban fares, it is a question if it would not be paid without much difficulty, provided

that the companies are willing to give the consumer of transportation the benefit of decidedly faster running times. It is indeed difficult to believe that electrification is the luxury that the Boston report attempts to prove, and it is highly probable that within a very few years it will be found to be one of the prime necessities of urban civilization.

WATER-POWER DEVELOPMENT.

The importance of the development of the water powers of the country is a subject which cannot be reiterated too often. We have taken occasion in these columns before to emphasize the great desirability of the early adoption by the Federal Government of a definite policy in regard to its public lands which include available water-power sites, and a policy which, while safeguarding the general public interests, shall not impose any unreasonable restrictions which would tend to delay development by making investors unwilling to finance such projects. Month after month has passed with little apparent progress toward definite results. Conventions of various kinds have discussed the matter, all shades and varieties of opinion have been brought forward, and the interests of different small groups of individuals have been found in conflict. The general discussion has seemed to crystallize the opinion that federal rather than local control and regulation is desirable, since many of the waters flow through more than one state, and the questions involved cannot inherently be brought under the control of local authorities. But if the Federal Government is going to control, it should set about doing it. Procrastination in this connection is a serious evil. It not only counteracts the efforts toward conservation of other natural resources, to which the administration claims to be favorably disposed, but it interposes an obstacle to the development of many communities which need the power, it halts those interested financially in the development of projects, and it renders difficult the enlargement of existing projects which have reached their limit of capacity, by making uncertain the future status of the whole matter.

The action of the National Electric Light Association in urging upon Congress the necessity for some move in this matter is a step in the right direction, and the Association should receive the support of all those interested in hydro-electric developments. Co-operation by bringing the matter to the attention of representatives in Congress will help to secure favorable consideration and action. The Association proposes that a commission be formed of members of Congress to investigate the facts and conditions affecting the whole matter, that such commission be appointed at the present session of Congress and do their work between sessions, thus making it possible to secure legislation at the next session. Since any action on the matter itself cannot be hoped for at the present session, the appointment of such a commission would do more to expedite matters than anything else could. It is to be hoped that such a commission will be formed; otherwise there is little chance for legislation even in the next session.

The subject is a momentous one; the interest in it is national; it is vital, and it is imperative. Only harm can be done by prolonged postponement. Action is called for. Let all friends of conservation, all friends of electrical development, all those in favor of opening opportunities for developing resources and financing important projects, let their voices be heard in urging a speedy solution of the questions whose present neglect means stagnation and waste.

TWENTY-THREE YEARS OF ELECTRIC RAILWAYS.

At a dinner which was held in New York City by the American Electric Railway Association, on January 27, the achievements of twenty-three years of electric railroading were celebrated, for it has been but little short of a quarter century since the first electric railway was put in operation at Richmond, Va., by Frank J. Sprague and Oscar Terry Crosby.

While this was not the first application of electricity to traction, the fact that it was the first venture of its kind made with a view to financially successful operation entitles its projectors to a full measure of consideration. The men connected with it had but little behind them to set a precedent for their method of operation, yet so well did they start their venture in the right direction that the growth of the industry has been almost without parallel. It is estimated that the electric lines of the United States carried, during the past year, about 10,000,000,000 passengers, and that in ten years this figure will be doubled.

With the development of the electric railway systems there have been a multiplicity of problems arising from the relationship of a concern in which a great amount of capital is invested, with the supporting public. The relations were a little complicated, and, moreover, they were absolutely new. It became a question of giving the investors an adequate return on their capital and giving the public the best service compatible with this. There arose the difficult task of satisfying both the public and the investor, and inasmuch as the voting passengers granted the company the right to operate, it was important that they should be satisfied.

Many states have already sought to solve the problem through public service commissions, and the work that has been done in conjunction with the railway properties has accomplished a great deal in the way of proper financing. When the extremely brief time that the problem has been in existence is considered, it is little short of wonderful that operations of such magnitude and of such changing nature are on such a sound financial basis.

It has been said with some truth that no investment is perfectly safe or so constituted as to be absolutely permanent, yet it seems that with the advance being made in the methods of operation and financing we may find in the elec-

tric railway an investment which is both. The question of making it so rests with public service commissions no less than with the railway companies themselves, and it is only by working together that the point will be reached where generally profitable railways will serve an entirely satisfied public.

PROMPT PUBLICATION OF TECHNICAL PAPERS.

Many of the original papers which are published upon scientific subjects are of such a nature that their contents are valuable at any time, and whenever they may be given to the world they add to the general store of knowledge and are a welcome addition. In some cases, immediate benefits are not felt because the world is not ready to assimilate the knowledge or because the publication is in such an obscure manner as to not receive the attention of those who could make use of the information. A classical example of this is the work of Wolcott Gibbs in physical chemistry, which for years received no recognition, but when finally known proved of as much value as it could ever have been.

In the case of more technical papers, co-workers in a subject are nearly always ready to assimilate whatever is offered, and there is little chance of anything valuable going unrecognized if published in any medium of general circulation.

But whether the subject be technical or purely scientific and whether the value be depreciated or appreciated by delay, there is never any advantage in withholding or delaying any publication of real value, for by so doing some one is compelled thereby to wait for information which it is to be assumed will be useful when received. It seems therefore to be the duty of those who have valuable material which will be helpful to others to publish it as promptly as possible, if it be of such nature as to receive publication at all. This is perhaps especially true of government publications, whose expense is justified only by the benefits which they may confer upon the public.

An example of needless delay in publication is furnished by the number of the *Bulletin of the Bureau of Standards*, which has just come to hand, although of date November, 1910, and containing articles all of which were written in the first half of the year 1910. The *Bulletin* itself does not receive wide circulation, the separate papers being reprinted for general distribution. In the case of two papers intended for the next issue of the *Bulletin*, separate printing has been accomplished in advance and distribution already made. This method is far superior to that heretofore in vogue and it is to be hoped that it will be made regular procedure in the future. No paper is then held back by others.

A majority of the papers published in the *Bulletin* deal with electrical and allied subjects, and it is of considerable importance to the electrical fraternity that they be made available as soon as possible.

THE VALUE OF ELECTRICAL SHOWS.

It has become customary to hold annual electrical shows in many of our large cities, and the practice seems to be growing in favor. New York, Chicago, Philadelphia, Minneapolis and others make this a regular feature of every winter season. The shows serve to arouse popular interest in the latest electrical devices for household use, as well as in modern electrical developments of a less intimate character. The benefits redound to both the local central stations and to the manufacturers, since the latter are enabled to sell more goods and the former supply current to operate the new devices.

That the principal function is to thus stimulate the general use of current by the public is evident from the predominating character of the exhibits. While machinery occupies some space and wireless and other spectacular exhibits are in evidence, the greater part of the floor space is given up to vacuum cleaners, washing machines, heating and cooking devices of various kinds, small motors and lamps for in-door use. Measuring instruments, insulation, cables, out-door lamps, etc., are seldom to be seen, for the show is not regarded by exhibitors as a medium for reaching electrical manufacturers. Its function is to reach the public, and judging by the throngs which usually attend these exhibitions, the object is very successfully achieved.

LIGHTNING AND FOREST PRESERVATION.

An investigation covering a long period of years, which has been made in one of the provinces of Germany, has demonstrated that the frequency of lightning strokes is less in wooded areas than in those which have been denuded of their forests. Where the forests have been regrown the frequency of lightning strokes has been decreased.

This furnishes an additional argument, if any were needed, for the preservation of wooded areas in the neighborhood of farm buildings and of towns. The strongest arguments for forest protection and maintenance apply to the mountainous regions where population and destructible property are scant, whereas the influence upon lightning is of importance in more densely inhabited parts of the country. The great and increasing destruction of both life and property from this cause renders the subject one of considerable importance.

The crusade which is being waged for the more general appreciation of and preservation of the young and growing timber and the restriction of lumbering to trees of mature growth is thus strengthened by one more consideration which appeals both to the reason and to the purse. It is hard in such matters to determine definitely the amount of protection to life and property which may be involved, but the mere fact of a relation—of a definite connection between cause and effect—should be sufficient to stimulate an interest in the matter.

THE MARKET FOR ELECTRICAL ENERGY.

ADDRESS BEFORE CHICAGO ELECTRIC CLUB.

An increase of its maximum load from 17,000 kilowatts in 1900 to 184,000 kilowatts in December, 1910, is the record of the Commonwealth Edison Company, Chicago, Ill., according to E. W. Lloyd, general contract agent of the Company, who presented a number of interesting statistics regarding the commercial development of the Company in an address before the Chicago Electric Club on January 25.

In 1890 the selling organization of the Commonwealth Edison Company comprised three or four men and it generally required approximately two weeks' time to supply service after a contract had been made, especially in the outlying districts. Today the selling organization of the Company comprises over 140 men, 100 of whom are outside solicitors, and it is the aim of the Company to connect a new customer's installation the same day the contract is closed, providing the premises of the customer are wired.

The development of new business has been due, according to Mr. Lloyd, to the liberal policy of the management of the Company. One of the chief factors in this respect has been the publicity given the affairs of the Company. The advertising department, under the management of Dana H. Howard, has been a valuable asset to the contract department. The policy of the Company is to advertise two times a week in the prominent newspapers of the city. This is augmented by program advertising and by the issuance of the Company's local magazines. Mr. Lloyd also mentioned the special campaigns which are carried on from time to time.

Referring to residence business, Mr. Lloyd said that the house-wiring campaign carried on by the Company, offering to wire a house at cost with two and one-half years to pay has resulted in obtaining 2,500 contracts for this work. A flatiron campaign, during which 12,000 irons were placed with customers on free trial, resulted in only 500 being returned at the expiration of the trial period. Campaigns on special lighting have resulted in the installation of 16,000 tungsten clusters about town on the rental basis. In ornamental street lighting the Company has signed 1,703 contracts for ornamental standards in various business sections. The income from the electric signs rented to business houses as a result of a strenuous campaign averages $500,000 for about 3,000 signs, and in addition there are amout 2,000 signs, privately owned, on the Company's lines.

Much of the success in the acquisition of residence business is due, according to the speaker, to the fact that no minimum charge is required. There are over 70,000 householders on the lines of the Company. The total number of customers is 130,000.

Regarding rates Mr. Lloyd explained, briefly, the different classes of rates and explained a new rate the Company is just perfecting. This is essentially an off-peak rate and comprises a primary charge per kilowatt of demand lower than the wholesale rate now in use. This rate can only be enjoyed by those who do not use current during the hours of 4 to 8 p. m. in November, December, January and February.

Mr. Lloyd then exhibited a number of curves showing various phases of the Company's business. The first curve showed the relation of the increase in population to the increase in earnings per capita. In 1890 the income per capita was fifty cents, in 1910, $4.50. The second curve showed the increase in the net connected load of the Company, which is 8,075,000 fifty-watt equivalents. The actual load is about forty per cent of the connected load. The next curve showed the relation of income from light and power to number of customers, and the last curve exhibited showed the results of the house-wiring campaign.

F. J. Postel asked Mr. Lloyd what percentage of the residence-lighting business averages less than $1.00 since the dropping of the minimum charge. Mr. Lloyd said about 3,000 customers average less than $1.00.

In reply to a question by A. Scheible as to how the Company would determine whether or not a customer would stay off of the peak in giving the new rate, Mr. Lloyd said they would be charged the regular wholesale rate and if the printing meter which would be attached to each meter showed the customer stayed off the peak a refund would be made.

Brief remarks were also made by Messrs. Taussig, Jackson, Perry and Phelps.

Joint Electrical Meeting in Chicago.

A joint meeting of the Chicago Section of the American Institute of Electrical Engineers and of the Electrical Section of the Western Society of Engineers was held at the rooms of the latter on the evening of January 25. The following nominations for the officers of the Electrical Section of the Western Society for 1911 were made and then elected by joint ballot: G. T. Seely, chairman; J. R. Cravath, vice-chairman; G. H. Lukes, new member of the executive committee.

On taking the chair Mr. Seely announced that the following papers were promised for the next joint meetings: February meeting, "Electrolysis of Iron in Concrete," by Prof. C. F. Burgess, of the University of Wisconsin; March meeting, "Engineering in War," by Caryl D. Haskins, of the General Electric Company; April meeting, "Electricity in Ice Plants," by August Smith, of Buffalo, N. Y.

The topic of the evening was an informal lecture by Prof. Morgan Brooks, of the University of Illinois. This was about his recent trip around the world and was therefore appropriately entitled "Inductions from a Closed Circuit of the Globe." The lecture was illustrated by a very large number of lantern slides, nearly all of which were from views taken by Professor Brooks or some one of his party.

Professor Brooks said a trip around the world is not a formidable undertaking. The service as a rule is quite good. For a person of moderate tastes the rates are on the average about three cents per mile plus $4 a day. His party traveled westward through Japan, China, India and Europe back to the United States.

Among the practically countless interesting things observed were the skillful manipulation of the wireless by a Japanese operator while crossing the Pacific and keeping in touch with land at all times; the two large Japanese engineering schools equipped with electrical machinery from all parts of the world; tungsten lighting on a special train in China; the technische Hochschule at Berlin; a Thury direct-current variable-voltage transmission plant; the three-phase electrification of the Italian railways; and a double hydroelectric plant in the Alps having a 900-meter head for the upper plant and a 500-meter head for the lower one.

H. Ward Leonard.

Among American engineers and inventors who have contributed greatly to the scientific development and practical application of electrical apparatus entering into many vocations, the subject of this sketch, H. Ward Leonard, stands as a conspicuous example of well directed energy and a finely developed intellect accompanied by prophetic vision and keen foresight.

H. Ward Leonard was born at Cincinnati, O., February 8, 1861. He graduated with the class of 1883 at the Massachusetts Institute of Technology, and in 1884 became one of Thomas A. Edison's personal staff of four engineers selected by Mr. Edison to introduce the Edison central-station system. In 1887 Mr. Leonard was made general superintendent of the Western Electric Light Company at Chicago, Ill. In 1888 and 1889 he was senior partner of Leonard & Izard at Chicago, this firm making many important installations of central-station plants and electric railways in various parts of the United States. In 1889 the firm was bought out by the parent Edison interests and Mr. Leonard became general manager of the light and power department of the combined Edison interests for the United States and Canada, with headquarters in New York City. In 1891 he resigned to establish his own independent manufacturing business, which is still operating as the Ward Leonard Electric Company at Bronxville, N. Y.

H. WARD LEONARD,
Inventor and Engineer.

For many years Mr. Leonard has retired from routine business duties and has devoted his time principally to experimental work and the patenting of his inventions. He has patented and has under application inventions aggregating in all more than 100. These inventions have covered apparatus devoted to a wide range of uses, and among the more important may be named those relating to electrically driven reversible rolling mills, electric mine hoists, locomotives, elevators, gasoline-electric trucks, transmission gearing for motor cars, rheostats, automatic switches, electric heaters, and automatic electric lighting systems for railway trains and motor cars, electric distributing systems and boosters. The Ward Leonard system of motor control in its various modifications has seen extended and important use in many fields, including the operation of gun turrets in the United States Navy; rolling mills, especially in Europe, where individual motors of more than 15,000 horsepower are frequently controlled by this system; and mine hoists, some of which employ as much as 2,000 horsepower and operate at speeds of nearly a mile a minute vertically.

Mr. Leonard has been vice-president and also a manager of the American Institute of Electrical Engineers, of which he has been a member since 1887.

Mr. Leonard was probably the first engineer to seriously advocate high-tension, single-phase traction for heavy railway work. His paper, read before the American Institute of Electrical Engineers in February, 1894, urging for heavy railway work a single-phase, 20,000-volt locomotive system with energy conversion on the locomotive and a voltage speed control of the motors, attracted widespread attention. Mr. Leonard was also a pioneer in developing a practical system of regenerative braking for single-phase and other systems.

During the past twenty years Mr. Leonard has been in intimate contact with the patent practice in this country and abroad and he has written many articles, indicating the necessity of reform in our patent system and patent court practice. He is an experienced motorist, having personally driven one of his motor cars more than 70,000 miles. He spends the summer months at his Canadian camp in the Georgian Bay district. where he owns a large number of islands, and he is an enthusiastic hunter and fisher.

Mr. Leonard has a very exceptional American ancestry, being descended, along different lines, from no less than three ancestors who lived in this country prior to 1639. One of these was John Alden, of Mayflower fame; another, Solomon Leonard, who came to America from England in 1629, and in 1642, along with Miles Standish, John Alden and several others, established Duxbury, the first settlement out of Plymouth; the other was William Ward, who came to America from England in 1639. A Leonard ancestor first established the iron and steel industry in America in the year 1651 at Taunton, Mass. Mr. Leonard's great-great-grandfather was General Artemas Ward, who was one of the most conspicuous figures in the period prior to the outbreak of the Revolution and was, upon May 19, 1775, appointed General and Commander-in-Chief of the forces raised by Massachusetts for the defense of the Colonies, and later, when Washington was made Commander-in-Chief for all

the Colonies, Ward was appointed second in command, being the first Major General of the American Army.

He is a member of numerous clubs, including the Union League Club of New York, the Engineers' Club, the Clove Valley Rod and Gun Club, the New York Electrical Society, the Scarsdale Country Club, the Lawrence Park Country Club, and several other social organizations, and is a life member of the American Institute of Electrical Engineers. He is a director of the Mount Morris Bank, of New York, president of the Sagamore Development Company, and has been president of the Village of Bronxville, where he resides in Lawrence Park.

American Electric Railway Association Dinner.

The American Electric Railway Association celebrated at a dinner held in New York City on January 27, the progress of the electric railway since the installation of the first electric line in Richmond, Va., nearly a quarter of a century ago. This line, which was put in with an idea of being financially successful, was installed by Frank J. Sprague and Oscar Terry Crosby.

There were 1,250 electric lines represented at the banquet, the total railway holdings being about 36,000 miles of track, or an average of about thirty miles to each company.

New York Section Organized.

The New York Companies' Section of the National Electric Light Association was fully organized at a meeting held on January 24 in the Twenty-seventh Street auditorium of The New York Edison Company. This section, which includes all the lighting companies of Greater New York, with the exception of the Brooklyn companies, which have their own separate section, bids fair to be one of the most successful in the Association, having already a membership of 500.

The officers of the section are as follows: Arthur Williams, chairman, The New York Edison Company; J. F. Becker, vice-chairman, The United Electric Light & Power Company; E. S. Bellow, treasurer, Westchester Lighting Company; Jesse Richards, executive secretary, New York and Queens Electric Light & Power Company; F. C. Henderschott, recording secretary, The New York Edison Company.

1912 National Electric Light Association Convention May Go to Portland, Ore.

At a meeting of the executive committee of the National Electric Light Association, held in New York on January 12, invitations to hold the 1912 convention in Portland were discussed. On motion of C. L. Edgar it was voted that it was the sense of the committee that the time had come to have a convention on the Pacific Coast. Mr. Campbell read the following abstract from the minutes of the meeting of the New England Section: "The opinion was expressed that so large and comprehensive an Association as the national body should not confine its meeting places to east of the Rocky Mountains, but should demonstrate especially to the people of the West that it is a national body and has the interests of every part of the territory in mind. The belief was expressed that to hold the national convention in Portland, in 1912, would be a practical and comprehensive demonstration of this broad comprehensive interest."

On motion of Arthur Williams it was voted that a committee of three be appointed by the chair to consider specifically the question of holding the 1912 convention on the Pacific Coast. The president appointed John Gilchrist, C. L. Edgar, and W. H. Blood, Jr., members of this committee.

Mississippi Electric Association Joins N. E. L. A.

A meeting of the executive committee of the Mississippi Electric Association was held in Meridian, Miss., January 19, at which much important business was transacted. Gulfport, Miss. was selected as the place for the next annual convention, June 20, 21 and 22.

The following subjects were selected for papers to be presented at the convention: "Engines of 750 Kilowatts and Under;" "Steam Turbines, 750 Kilowatts and Under, Non-Condensing and Condensing, and Low-Pressure Turbines in Connection With Enginesof 500 Horsepower and Less;" "Electrically Heated Appliances;" "Relation of Our Employees to the Company and to the Public;" "The Necessity for a Commercial Department." A paper by the Engineering Department of the National Electric Lamp Association is also announced. A committee was appointed on National-Electrical-Code requirements and appropriation made for conduct of the Question Box.

The unanimous consent of all the member companies of the Association having been obtained, it was voted to affiliate with the National Electric Light Association as a State Section.

Toronto Section Meeting.

On January 26, T. C. Martin, executive secretary of the National Electric Light Association, addressed the members of the Toronto Section on "The Organizing of An Industry." Mr. Martin commenced his address by stating that he believed the evolution of any art should carry with it the evolution of an industry, and that unless art was really firmly established an industry could not result. He spoke of the wonderful progress of the electric-light industry since its comparatively recent inception.

Chicago Subway Plan.

Chicago is to have the most elaborate subway system of any city in the world. Complete details of the plans which will revolutionize the transportation business of the city have been worked out by Bion J. Arnold and will be submitted to the Mayor and City Council shortly. Mr. Arnold has provided for tunnels that will extend clear from building line to building line. By utilizing the space under the sidewalks, not only is provision made for the housing of public utilities, but four, and in some streets six, tracks are to be laid for street and elevated railroad traffic.

The bottom of the subway will be forty feet below the street level at its greatest depth. It will be constructed on two levels, so that there will be no grade crossings below the ground.

The subway system planned is said to be elaborate enough to accommodate all the cars now using both the surface and the elevated loop.

Instead of hauling empty cars for several miles downtown to accommodate the evening rush of traffic, Mr. Arnold proposes to build a big storage room under Grant Park, where the cars could be stored.

The first section of the system which will be recommended will run from the vicinity of Chicago Avenue and Wells Street to Twenty-second and State Streets, running east in Randolph Street from the La Salle Street tunnel to State.

Electricity in a Modern Hotel.

Electrical and Mechanical Equipment of the Hotel Sherman.

The new Hotel Sherman, located at Clark and Randolph Streets, Chicago, which has recently been opened, forms an important addition to the City's hotel facilities and in point of electrical and mechanical equipment stands as an ideal exponent of present-day engineering practice.

The Hotel Sherman is a first-class modern fireproof structure in every detail, and will afford accommodations that are nowhere excelled. The building fronts 160 feet on Randolph Street and 180 feet on Clark Street and is fifteen stories high. It contains 757 guest rooms, each of approximately 352 square feet floor space, and every room provided with a bathroom.

The exterior of the building is gracefully proportioned and is finished in such a manner as to be especially pleasing. From the sidewalk level up to a height of about ten feet the building is finished in white granite and from this point to the roof the facing is a rich cherry-red pressed brick with white granite trimmings. The roof is of green tile with white trimmings.

MAIN LOBBY OF NEW HOTEL SHERMAN, CHICAGO, ILL.

The interior of the hotel is finished in a manner in keeping with its exterior and every convenience and improvement known to hotel practice is provided for the comfort and convenience of the guests.

For the mechanical operation of the vast amount of equipment installed in this hotel—such as refrigerating plant, ventilating fans, laundry machines, pumps, elevators, etc., electric power has been employed exclusively and this installation is indicative of the present importance of electricity as a potent factor in hotel operation.

The motor installation aggregates 660 horsepower, 450 horsepower of which is utilized for operating ventilating fans. The lighting load comprises 15,500 incandescent lamps of fifty-six-watt equivalents. All electrical energy is supplied by the Commonwealth Edison Company, Chicago, and as this is the largest hotel on the lines of the local central-station company the cost of operation of this plant will be closely watched.

The Hotel Company entered into the regular contract, without guaranty,

with the Commonwealth Edison Company for wholesale rates which comprises a primary charge per month of $3.20 per kilowatt of the consumer's maximum demand in such month up to and including twenty kilowatts; $2.50 per kilowatt of the excess of the consumer's maximum demand in such month over twenty and up to and including fifty kilowatts; $2.20 per kilowatt of the excess of the consumer's maximum demand, in such month, over fifty kilowatts. The secondary charges are per month, six cents per kilowatt-hour for the consumption in such month up to and including 2,000 kilowatt-hours; three cents per kilowatt-hour for the excess consumption, in such month, over 2,000 and up to and including 5,000 kilowatt-hours; and 1.4 cents per kilowatt-hour for the excess consumption, in such month, over 5,000 kilowatt-hours.

The power plant apparatus of the Hotel Sherman is divided between the two sub-basements underneath the main basement in which the College Inn, barber shops, etc., are located. In the lower basement are located the boilers, boiler-feed pumps, auxiliary pumps, and part of the ventilating equipment. There are three 400-horsepower Stirling water-tube boilers equipped with Green chain-grate stokers. The boilers, operating under a working pressure of 150 pounds, are located in a single row along the north wall of the plant, fronting the alley.

Coal may either be brought to the building in wagons and dumped in receiving hoppers from the alley, or in cars of the Illinois Tunnel Company, the floor of the plant being on a level with the tracks of the tunnel system. Coal brought into the building in tunnel cars is dumped into receiving hoppers and then elevated, by means of a motor-driven elevator to the coal storage bins over the boilers. By means of a traveling discharger, coal may be delivered into these bunkers at any desired point. The coal bunkers are of concrete construction and have a storage capacity of 100 tons for each boiler.

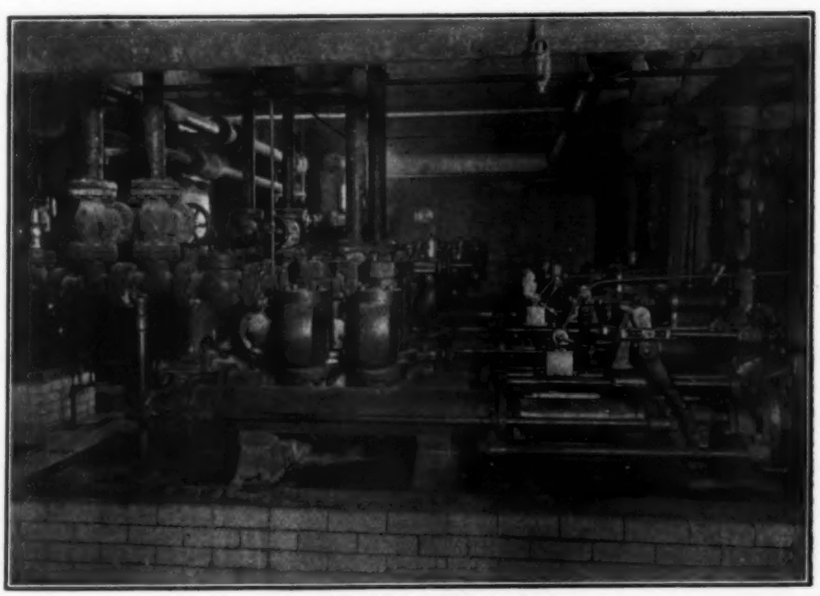
Ashes are dumped from the grates into a motor-driven conveyer which conveys them to a concrete ash bin located adjacent to the coal bunkers. From this bin the ashes are loaded into tunnel cars and hauled away.

The heating apparatus in the Hotel Sherman consists mainly of a direct system with auxiliary fan blasts for heating and ventilating the main lobby, reception rooms, dining rooms and public rooms. All guest rooms are heated by direct radiation alone. The total direct system is operated as a two-pipe Dunham vacuum system.

VIEW IN BOILER ROOM.

The total direct radiation aggregates 31,000 square feet and together with the blast coils, containing a total of 12,000 square feet, is installed to utilize exhaust steam from all pumps and live steam direct from the three boilers. The pressure of 150 pounds is reduced by a fourteen-inch Davis pressure-reducing valve located on the main leading from the high pressure header to the expansion tank.

The low-pressure system proper begins at the connection on the high-pressure header that leads to the expansion tank. From the expansion tank all low-pressure heating lines emanate. As a safety precaution, one sixteen-inch relief line with back-pressure valve, and cut-out valve in same, extends to the roof.



VIEW OF PUMP INSTALLATION.

The main heating lines for the direct radiation comprise a one-tenth inch main running direct to the attic, where it circles the same and branches to supply risers beneath, and a one-fourth

inch main located in the basement to heat all direct radiation on the first floor.

The return system of piping is analogous to the supply system, there being

MAIN SWITCHBOARD.

an independent system for each main supply. The return risers are run as near as possible to the supply risers and connections to radiators are carried behind or below the radiator.

The ventilating system in the hotel is

MOTOR-OPERATED VENTILATING FAN.

complete in every detail. The general system is divided in several sub-divisions, each of which forms a complete unit. For ventilating the basements and the College Inn there are provided, in the lower basements, three blast fans driven by fifteen-horsepower motors. In the first basement are three additional fans for furnishing fresh air to the banquet hall and on the first floor are three fans for supplying the kitchen and private dining rooms. All fans are operated by Bullock shunt-wound semi-inclosed motors of thirty-five and fifteen horsepower size, depending on the size of the fan, in some instances belt connected and in others direct connected to the fan. There are two fresh air intakes on the room which convey the fresh air to the basement, where it is passed through Niagara air washers and thence conveyed through galvanized iron ducts to tempering coils and to the fans. Arrangement is also made for coooling the washed air in summer.

Foul air from the various public rooms mentioned is conveyed through ducts to the attic where there are installed a number of exhaust fans which remove the foul air from the building. A view of one of the ventilating fans installed in the basement is shown in one of the accompanying illustrations.

The refrigerating plant in the Hotel Sherman is a model of its kind. It is of the absorption type and has a capacity of seventy-five tons and the plant actually manufactures ten tons of ice per day. The refrigerating machinery, which was supplied by the York Manufacturing Company, York, Pa., is installed in the second basement and comprises a generator, of the shell and coil type; a vertical analyzer; one dehydrator of the submerged type; separator; ammonia condensers; ammonia receiver; exchanger, absorber; brine cooler, of the shell and coil type; freezing tank and pumps. The pumps comprize two duplex 8-by-10-by-12-inch steam-driven brine pumps, two simplex double-acting 14-by-8-by-12-inch ammonia pumps capable of handling aqua ammonia of any strength and two motor-driven 4-by-6-inch drinking-water pumps for circulating ice water to the various rooms. For this purpose there is also provided a complete filtering plant. The freezing tank is provided with a hand hoist and traveling crane to remove the ice freezing tank and placing it in the ice storage.

In connection with the refrigerating plant there is provided a number of ice shaving and cubeing machines, all driven by individual motors, for preparing the ice for use in the dining rooms, buffet, etc.

Located just west of the ice plant is the main switchboard of the plant where connection is made with the mains of the Commonwealth Edison Company.

The switchboard which was built by Kohler Brothers, Chicago, is composed of nine panels, two inches thick, of oil-finished Monson slate and has a total length of twenty feet and a total height of eight feet, being set out five feet from the wall with both ends closed off with slate partitions and grill-work doors. The space between the top of

the board and the ceiling is occupied by a steel junction box running the entire length of the board, in which the conduits terminate, the circuits being brought out at the bottom through bushings immediately above their respective switches or circuit-breakers, and attached to a terminal board. Connection is made from this terminal board to the switches and circuit-breaker studs by means of busbar copper.

The panels comprise one house meter panel containing twelve Sangamo wattmeters; one main service panel containing the main Commonwealth Edison wattmeters and printing meters, the ground detector and voltmeter switches, push button switches for switchboard lights, and the main service switches consisting of four 1,000-ampere switches for the four positive and negative mains and one 2,000-ampere neutral switch; two power feeder panels, each containing six I. T. E. autoite-type circuit-breakers; four lighting feeder panels, each containing eight three-pole knife switches with inclosed fuses on separate rear panels; and one gauge panel containing the various air, steam and other pressure gauges.

A Weston illuminated-dial voltmeter is mounted upon a swinging bracket at the right of the board. A handsome fifteen-inch dial Seth Thomas switchboard clock is mounted in an ornamental slate panel above the center panel.

Running the full length of the board at the bottom is a brass pipe which is connected to the compressed air system of the building, this pipe has an outlet at each end on the front and rear of the board where a hose may be attached and used for blowing the dust and dirt from the various parts of the board, a nickel plated reel with air hose and hard rubber nozzles is placed behind the board at each end.

All wire used in the Hotel Sherman is run in iron conduit, concealed in the floors, partitions and wire shafts. All mains and sub-mains for electric light are installed on the three-wire, 110-220-volt plan, and all power mains are installed on the two-wire 220-volt plan.

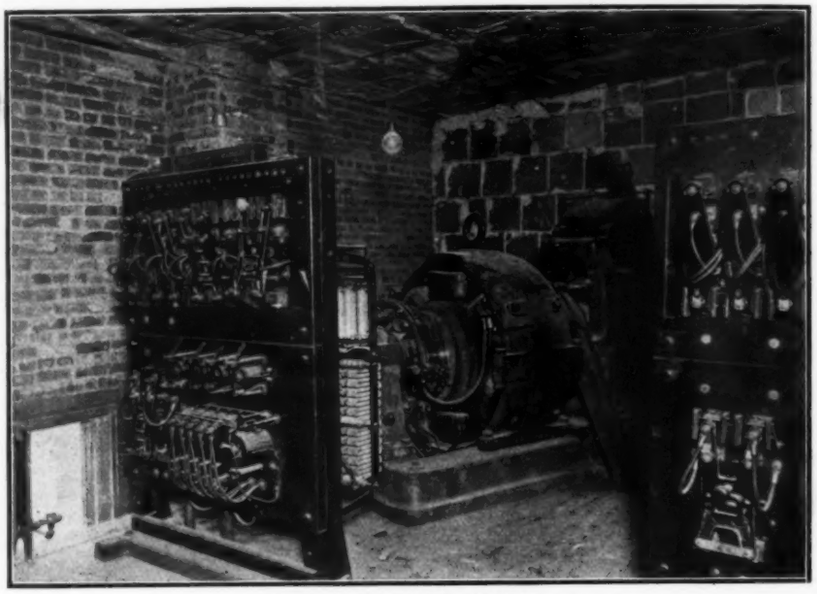
At the four corners of the corridors there are wire shafts in which the cutout centers are located. The vertical runs of all mains are up these shafts. From the cutout centers in the wire shafts are run the distributing circuits to the various outlets. At each motor outlet there is provided a panel board of black Monson slate on which is mounted the main line switch and fuse for each connected motor.

All switch, light and wall outlets are provided with approved steel outlet boxes. Each bathroom of the hotel is provided with a plug outlet for the use of electric curling irons. Each corridor is also provided with plug outlets for the connection of vacuum cleaning apparatus.

For the general lighting of the hotel 15,500 incandescent lamps and 420,000 feet of copper conductor for the various circuits are used. Mazda lamps are extensively used and these are augmented with tantalum-filament lamps in numerous instances.

The basements, power plant, boiler room, etc., are lighted by means of in-closed-arc lamps. The main lobby is lighted by six ornate electroliers suspended from the ceiling, and four standard clusters on the short walls in front of the pilasters. The electroliers are each equipped with fifty-five forty-watt, frosted-globe Mazda lamps.

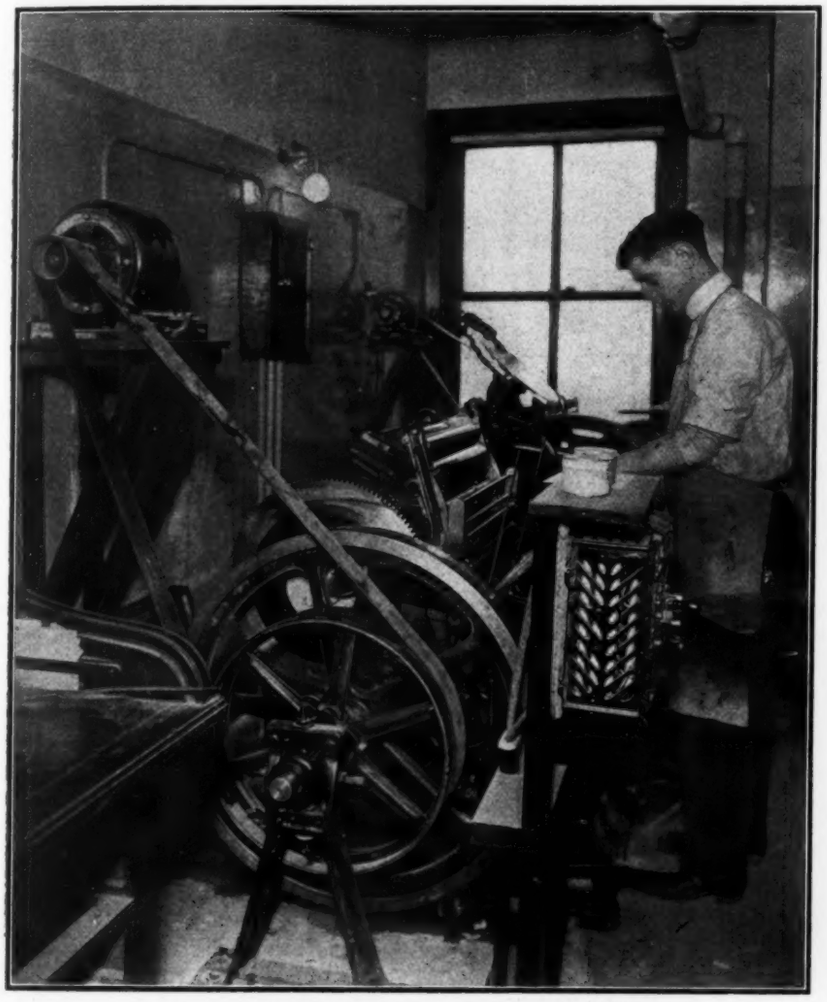
The guest rooms of the hotel are located entirely above the third floor and are 757 in number. All rooms are provided with large closets and private



VIEW OF ELEVATOR MOTOR.

VIEW IN LAUNDRY SHOWING WASHERS.

connecting baths. In each guest room there is an artistic central ceiling fixture, equipped with two forty-watt Mazda lamps, for the general lighting, and in addition a portable reading lamp placed on the writing desk. Over each dresser are provided two tantalum lamps and in the bathroom there are provided two sixteen-watt Mazda lamps mounted on rods on each side of the mirror and so arranged that the person using the mirror can raise or lower the lights to a suitable position.



MOTOR-DRIVEN PRESSES IN HOTEL SHERMAN.

A feature of the guest-room lighting is the automatic control of the lamps in each room. For this purpose each corridor door is equipped with a door-switch installed in the keeper of the door lock. The regular push button switch installed in the room has an electro-magnetic attachment controlled by the door-bolt switch. Locking the door on the outside extinguishes the lights, but locking or unlocking the door on the inside does not affect them. When the room is occupied the lights are entirely under the control of the occupant, by using the room switch.

The elevator installation in the Hotel Sherman comprises seven electric elevators, four passenger, two freight and one lift running from the basement to the ground floor. The elevators are all the electric-type, using worm-gear-traction machines overhead. A view of one of these motor-driven machines is shown in one of the accompanying illustrations. The elevators are all provided with car-switch control and all modern signals. The installation was made by the Otis Elevator Company.

The Hotel Sherman Company has spared no expense in providing for the utmost speed and accuracy in the fulfillment of the orders of its patrons.

Two dumb-waiters, each operated by a seven and one-half horsepower motor, extend from the first floor to the top floor. The motors are placed above the shaft. The operation of these dumb-waiters is under the control of a dispatcher in the kitchen. If an attendant in any one of the service pantries wants an elevator he pushes a button which lights a lamp at the dispatcher's station in the kitchen. On receiving the signal, the dispatcher presses a numbered push-button which sends the dumb-waiter to the floor from which the call originated. The dispatcher in the kitchen is at all times aware of the position of a car, the system being equipped with a lamp-signal device. For reasons of safety, the cars cannot be operated unless all of the doors in all shaft openings are closed.

The telautograph system installed is of the inter-communicating type and provides for six main stations located in the hotel offices and in each of the service pantries on the upper floors. In connection with the house telephone service, the telautographs will be used to keep a direct record of orders transmitted in the routine of hotel service.

Telephones are installed in every room and department of the building, aggregating about 800 instruments. On the mezzanine floor there is provided a specially fitted telephone room in which is installed a special Western Electric switchboard.

The laundry equipment for the Hotel Sherman represents the very latest types of machines in every department and embodies in its arrangement and methods of installation the most advanced ideas.

It consists of No. 11 iron-bearing standard washers, especially commodious and efficient; twenty-eight-inch solid curb extractors; a twenty-inch starch extractor—the first removing the moisture left in the goods after the washing process, the latter the surplus starch after starching; a wood flat clothes tumbler and a dryroom tumbler, where the goods as they revolve are dried by a torrent of hot air driven through them; three ironers, a 48 by 120 Trojan and a six roll, each with a capacity of 15,000 pieces of flatwork a day and a No. 0 Triplex for the small and delicate pieces; a four loop conveyor dryroom, where the starched pieces are borne on a track through a cabinet heated by steam coils, until perfectly dry, when they are dropped automatically into a basket outside, a spe-

cial dryroom for lace curtains; two starchers.

In addition there are the necessary stationary tubs and soap tanks, starch, ironing and finishing tables, electric irons and finishing machines.

The entire plant is motor driven. As may be seen in one of the accompanying illustrations, the washers are located in two rows, each row of machines being operated from a main shaft, which is driven by a fifteen horsepower Crocker-Wheeler motor. The plant contains two motor-driven presses, which are shown in one of the accompanying illustrations. The large press, a 14 by 22, is driven by a one-horsepower Crocker-Wheeler motor, and the smaller, a 10 by 15, is driven by a one-half-horsepower motor of the same type.

In addition to the motors already mentioned there are a number of small ones employed in the kitchen for operating such apparatus as potato peelers, egg beaters, coffee grinders, five extractors are also driven from these two main shafts. The two large mangles are each operated by a three-horsepower Crocker-Wheeler motor direct connected to the machine. The three ironers are belted to a shaft driven by a five-horsepower Crocker-Wheeler motor. The entire laundry is said to have a capacity of approximately 30,000 pieces a day.

The hotel is also provided with a printing plant, in which all the menus, order blanks, stationary, is printed. The meat choppers, etc. All motors throughout the building are controlled by Cutler-Hammer starting boxes.

The architects of the hotel were Holabird & Roche. Martin C. Schwab was the consulting engineer; the Cuthbert Electric Company the electrical contractors.

Miles Wilkinson, chief engineer of the hotel, who is responsible for many of the features embodied in the mechanical equipment, is in entire charge of the plant.

The Minneapolis Electric Show.

The second annual electric show of the Northwestern Electric Show Association was held at the National Guard Armory, Minneapolis, Minn., January 26 to February 4. The management was well pleased with the reception accorded by the public and it was conceded to be the best electrical exhibition ever given in Minneapolis.

The booth arrangement was similar to that of last year, only that one entire row of booths was omitted, allowing more aisle space and slightly increasing the size of each exhibit. The booths were marked off by posts topped with art-glass domes containing tungsten lamps. Iron arches over the booths supported art-glass globes and also served as conduits for all wiring. The walls were draped with white and green bunting and in the balcony huge paintings formed a part of the wall decorations. A canopy of black fabric covered the ceiling and when all lights were extinguished a skyrocket would

MINNEAPOLIS ELECTRIC SHOW VIEWED FROM BALCONY OF ARMORY.

shoot from the corner of the building and when it reached the center, high above the heads of the spectators, would burst into showers of light which would gradually fade and die out. There were a series of skyrockets set off, of various colors and conformations and with the audible arrangement, the effect was thrilling and spectacular. The entire arrangement was unique and was effected by a number of flashers. The streamer leading from the balcony was made up of sixteen-candle-power lamps. The center-piece contained 262 four-candlepower lamps arranged in circular rows in the form of an inverted pyramid. Surrounding this were about 150 red and green sixteen-candlepower lamps suspended on pendants of various lengths. Evenly balanced in the center of the entire group and hanging below all other lights were five 400-watt frosted tungstens with reflectors. Smaller reproductions of the center-piece appeared in each of the four corners and were constantly lighted.

The band concerts given by Rossiter's Band and the solos of Miss Blanch B. Mehaffey were enjoyed by all who attended.

The Minneapolis General Electric Company had the largest exhibit and occupied the same space as last year, immediately to the left of the entrance, extending to the side of the building with two booths along the side. A number of interesting features showing the various methods of lighting were advantageously and admirably demonstrated. Three model show windows were grouped at one end. These windows were elegantly trimmed, and attractively displayed groceries, ladies' gowns and millinery, hardware and cutlery, respectively. Adjoining this were two rooms representing kitchen and living room, equipped with every known electrical appliance used in modern households. In the latter room five different types of illumination were installed and operated for comparison. Still another booth contained a miniature eight-room residence perfectly constructed and furnished complete in every detail. The purpose of this demonstration was to show how to get the highest efficiency of light and service at the least possible cost by the improved methods of wiring and the convenient placing of switches. There was also a display of a great variety of electric-lamp shades.

GENERAL VIEW OF ARMORY DURING ELECTRIC SHOW AT MINNEAPOLIS, MINN.

Prof. H. T. Plumb gave a series of lectures illustrated with demonstrations of high-frequency effects. A Tesla oscillator and coil were used, and the startling effects produced by the high voltages and high frequencies attracted much attention. High-voltage discharges, corona effects, and induction phenomena were included.

Valuable prizes in the form of washing machines, electric irons, toasters and other household electric appliances

were distributed each day to the visitors holding the lucky numbers.

LIST OF EXHIBITORS.

Alco Motor Sales Company exhibited a Model V four passenger extension coupé and a Baker chassis. Represented by M. R. Myrras and E. E. Olive.

American Ironing Machine Company had on exhibition several Simplex electric ironing machines in operation. G. A. Renner was in charge.

J. Andresen & Company exhibited an assortment of brass fixtures. A feature of this exhibit was a metal spinning machine in operation, giving a practical demonstration on the spinning of brass. Jacob Andresen represented the company.

Vernon Bell & Company showed a full line of electrical appliances and a private telephone system. Represented by Vernon Bell and C. V. Bell.

Berger Manufacturing Company, Minneapolis, Minn., demonstrated stationary electric vacuum cleaners.

Bishop & Botrack Company had on exhibition an automatic electric carbonator for soda fountain use and an automatic electric air-pump. The company was represented by C. Schraske.

Burroughs Adding Machine Company exhibited various types of its machine. Two machines were automatically kept in constant operation night and day during the show. P. K. Russell was the representative.

Bryan-Marsh Company, Chicago, had a prominent location and exhibited a complete line of Mazda lamps and Holophane reflectors. J. R. Smith, J. L. Boersed and S. Furst in attendance.

Cadwell & Brown Company, Minneapolis, exhibited a complete line of wagon motors, sanitary pumps and Just tungsten lamps. George J. Cadwell was in attendance.

Central Electric Company, Chicago, exhibited Okonite wire and tape, Pelouze heating devices, Patterson wireless battery holders, Faraday bells and buzzers, D. & W. fuse, Columbia lamps, Pacific toasters and Knight adjustable hangers. The company was represented by D. C. Penneman and E. S. La Clare.

Central High School, Minneapolis, maintained an interesting exhibit of electrical apparatus made by the students.

Crane Company, Chicago, Ill., had on exhibition a complete line of high and low-pressure, steam, water, air and ammonia valves, fittings and accessories.

L. F. Dow & Company, Minneapolis, had a number of electrically operated Multigraph, folding and adding machines on exhibition. Represented by H. H. Batcheller.

Electric Carriage & Battery Company showed a R. & L. electric four-passenger coupé with enclosed chain-drive and new patented side lamps, each having a contained parabolic reflector. Also a Walker balanced gear, 1,500 pound electric truck. R. L. Lunt, Eng., M. L. Hughes, A. H., Charles Dalley and M. R. Libby were in attendance.

Electric Shop, Minneapolis, showed a complete line of electric household appliances, including washing machines, toasters, irons, fans, etc. Represented by D. Rollins.

Electrical Engineering Company, Minneapolis, exhibited a full line of electrical specialties for general electric and construction work. A special feature of this exhibit was the electric horse which appealed to those who love horseback riding and afforded considerable amusement to the spectators.

Electric Vehicle Company, Minneapolis, had on exhibition a Detroit electric of 1911 Model. A special feature of this four-passenger brougham was the direct shaft drive from pinion of motor to gear of rear axle. The exhibit was in charge of A. C. Duckett.

Fairbanks, Morse & Co., Chicago, Ill., showed a complete suburban electric lighting and water plant in operation. Many features of their system are new and unique. Competent engineers were in attendance to explain its workings and solve such problems as were presented by those interested. In addition they displayed samples of their line of direct and alternating-current machinery. The company was represented by A. E. Garland.

Farnham Printing Company, Minneapolis, had on exhibition, in operation, folding and binding machines. Also the new single letter Monotype. The programs of the Electrical Show were bound and stitched at this booth. F. H. Johns was in charge.

Fawkes Auto Company, Minneapolis, exhibited an Ohio electric coupé, showing extensive features in their magnetic controller and absence of universal joints. W. D. Rightwire was in charge.

General Electric Company, Schenectady, N. Y., maintained a large and prominent exhibit, displaying a complete line of electrical apparatus including heating devices, motors, transformers, full assortment of tungsten lamps, sewing machine motors, wiring devices and Holophane reflectors. A. G. Flutcher and A. Mungle were in attendance.

Hackney Electric Ventilating Company, St. Paul, had on exhibition a new system of window ventilator which is known as the Hackney system. J. B. Murphy in charge.

Hollis Electric Company, Minneapolis, showed a complete line of Century and Crocker-Wheeler motors, Allen-Bradley starters. Also a full line of auto lighting equipment. Represented by T. W. Findley.

The Holophane Company was represeneed by Morgan P. Ellis and has displays in a number of exhibits. This company also furnished all reflectors used in the booth illuminations.

Hughes Electric Heating Company, Chicago, Ill., displayed a complete line of its electric ranges, cook stoves and hot plates. Practical demonstrations in cooking were given and were of great interest to the specialties. Geo. A. Hughes was in attendance.

Ireland & Simmons Company, Minneapolis, exhibited a full line of electric light fixtures. H. E. Miller was in charge.

Kemp Bros. Auto Company, Minneapolis had on exhibition, a Waverley electric Model 8, four-passenger brougham. Represented by J. E. Kemp.

R. M. Laird, Minneapolis, displayed a complete assortment of llg fans, Everson vacuum cleaners, Federal goods and Thor electric washers. J. F. Chellingwain in charge.

McRoy Clay Works exhibited its line of underground conduits, including single and multiple vitrified clay conduits. C. C. Baird and H. K. Weld were in attendance.

McCrum-Howell Company's exhibit attracted considerable attention at the show. The "Richmond" portable suction cleaner was shown on one side and the stationary plants on the other. The entire booth was artistically decorated in white and old rose with silk panels extending around the three side walls. The section where the stationary plants were exhibited was finished in solid white to suggest the cleanliness made possible by the use of vacuum cleaning machines. On exhibition were four Richmond suction cleaners, portable machines and two stationary plants. F. C. Allen of the New York office was in charge.

Minneapolis Electric Motor Company, Minneapolis, exhibited a three-hundred-mile wireless outfit, Royal vibrators and the Simplex heating line complete. Holophane glassware formed an attractive part of this display. C. L. Holton was in charge and was also editor of the *Electric Show Daily*, published by the Minneapolis Electric Motor Company.

Northwestern Electric Equipment Company, Minneapolis, had on exhibition a full line of fans, Hot Point irons, and electric lamps. Jule M. Hannaford, Jr., was in charge. There was also displayed in this booth a line of conduit cement-breakers and high-tension oil switches, including a 1,200-ampere electrically operated oil switch controlled by means of a very powerful magnet. Represented by J. E. Erickson and C. C. Badean.

Northwestern Telephone Company, Minneapolis, had a very complete and interesting exhibition of telephone apparatus consisting of a No. 4 Mahogany eighty-line switchboard in operation, giving service to all exhibitors, complete line of various types of telephone instruments and switchboards. Also the new cordless switchboard which was successfully demonstrated.

Minneapolis Gas-Fixture Company, Minneapolis, had a very handsome display of electric light fixtures. D. E. Vearham in charge.

M. J. O'Neil, Minneapolis, exhibited an attractive assortment of electric light fixtures.

M. F. Patterson Dental Supply Company, Minneapolis, showed a model dental office containing a complete equipment.

Pike Electric Manufacturing Company, Minneapolis, displayed its various types of panel board.

Pierson-Wilcox Electric Company, Minneapolis, had on exhibition a line of Sprague and General Electric motors. This Company had charge of the electrical installation of the show. Represented by R. W. Pierson.

Root & Company represented the Hupp-Yeats Electric Car Company, of Detroit, Mich., and had on exhibition a four-passenger electric of French design. Mr. Root was in attendance.

Frees Patterson Company exhibited the Santo vacuum cleaner, Keller duplex stationary cleaner, White Lily Electric wash and Vohe Ozone machine. J. R. Vrooman was in charge.

Studebaker Company of South Bend, Ind., had on exhibition one four-passenger electric coupé and one Model 25 1500 horsepower capacity commercial electric. Represented by A. E. Thompson.

Tungsten Maintenance Company, Minneapolis, exhibited a full line of Alba reflectors and electric fixtures.

Zimmer Vacuum Renovator Company, Minneapolis, displayed several vacuum cleaning machines consisting of the Zimmer No. 22, Morey stationary, Russell portable and Zimmer rotary. The last two mentioned are portable machines.

The Western Electric Company had a well arranged exhibit consisting of a very complete line of telephone apparatus, Hawthorn motors, transformers, Mazdaliers, heating devices and house goods. Considerable interest was shown in this company's exhibit of its line of inter-phones and the new type of telephone switchboard, popularly known as the sectional "bookcase" unit type board, which was shown here for the first time. F. Geeseka, W. D. Anthony, G. E. Brown, P. F. Roney, J. P. Carson, Jr., Jas. Houghtaling and L. T. St. John were in attendance.

Westinghouse exhibit contained exhibits of the Westinghouse Electric & Manufacturing Company and the Westinghouse Lamp Company. The Westinghouse Electric & Manufacturing Company featured its general utility motor showing one of these motors mounted on a sewing machine using the motor as a sewing machine motor; one belted to a small lathe showing this motor as a power motor; one motor with blower attached showing the blower application and one motor with chuck for holding either an emery or buffing wheel, showing a grinding and polishing motor. These motors were all in use and actual work being done on the sewing machine, lathe and with the emery and buffing wheels on the motor arranged for grinding and polishing. Another feature at the Westinghouse Exhibit was its new 1911 model fan motors, including the twelve-inch and sixteen-inch mechanically oscillating fan motors for either wall or desk exhibit is in charge of W. Barnes Jr., of the Westinghouse Department of Publicity, Pittsburg, Pa

LOGICAL BASIS FOR VALUATIONS OF INTERURBAN STREET RAILWAYS.[1]

BY C. G. YOUNG.

[The first portion of this article appeared in last week's issue. In it the author discussed the necessity for a comprehensive survey of the whole situation, the importance and growth of interurban electric railways, the necessity for encouraging investments in these properties and of providing an adequate return upon these investments, the purpose of valuation and rate of return]

RATE OF RETURN, (*continued.*)

(5) Nine per cent on extensions of small properties showing small surplus earnings, involves more substantial risk due to lack of any considerable surplus of earnings, and the investor will regard it somewhat in the class of a new property, and that the new extension must not only earn its fixed charges, but also a surplus on the original property, to warrant the construction of the extension, and therefore expected earnings of nine per cent would not be too large.

(6) Ten per cent on new properties where the estimated net earnings for the first year of operation under accepted methods are from eight per cent to ten per cent on the total cost of organizations, construction and development, is the position of a projected new property for which capital cannot be expected unless there exists a possibility, if not a reasonable probability, of receiving ten per cent on the investment.

(7) Twelve per cent on new properties where the estimated net earnings under accepted methods would not pay five per cent on the cost of organization, construction and development during the first three years, but where ultimately it is estimated that the property would earn good dividends, is perhaps met more frequently in projected steam railroads to be constructed in new territory not yet developed and requiring transportation facilities to make the territory valuable. As a rule, it requires several years for the development of such territory, construction of new towns and villages, and therefore a railway cannot always hope to earn interest on its bonds for the first few years, and it will be conceded that a very substantial risk is taken by the investor who undertakes to develop new territory, and therefore he is rightfully entitled to ultimately receive a correspondingly larger return on his investment.

(8) A variable percentage on existing properties. Where bonds and stocks have been regularly issued and disposed of and where the earnings may or may not show a surplus, it is much more difficult to determine what would constitute a reasonable profit or a fair rate of return on the investment or upon the securities already issued and outstanding. This rate of return would and should vary as between the classes of properties, their extent, location, convenience, service, stability, etc.

In cases of building extensions to existing properties there is more or less risk, in respect to what increase in net earnings will be secured, and unless the investor can anticipate a higher return than he can obtain in what may be called "seasoned securities," he will naturally not invest in new securities required for extensions of public utility properties, nor would the corporation be warranted in making extensions unless the surplus earnings could thereby be increased and the position and stability of the property benefited. As a matter of fact, however, corporations do make extensions to improve their facilities to the public—their clients—even though there may be no immediate return, yet hoping and trusting to ultimately benefit thereby.

Take the case of a proposed new interurban electric railway or any other proposed new public service utility: It may be reasonably certain that investors cannot be found for any new public service property unless the estimated expected net earnings are likely to show from seven and one-half per cent to ten per cent on the total cost of the organization, construction and development, therefore, if by government action, the rate of return is likely to be unduly limited to less than what can be obtained in other investments there will be no investment capital available for public utility properties.

The construction of an interurban railway certainly adds greatly to the convenience of the public and greatly enhances the value of the land throughout the territory served. In fact, the actual enhancement in value of the tributary land might aggregate more than the total cost of the railroad and the investor would frequently make more profit by buying up land along the projected railroad than he could possibly make by investment in the securities of said railway, even though his return was not limited to even less than fifteen per cent.

A prominent builder of steam railways has very pertinently said that in the case of a new steam railroad built through new territory, causing the land to increase in value 1,000 per cent or more, as is usually the case, no objection is made by the public, the purchasers of the land nor by the government, and no attempt is made to hold the value of the land down to its original total cost value, yet the steam railroad, that has created these enormous values in land and added great and needed facilities for the people, is told that it cannot be permitted to maintain tariff rates which would enable it to receive a return of ten per cent to fifteen per cent on its total cost, nor to permit its total valuation to increase by reason thereof in proportion to the risk taken by the investor, and certainly it would not be permitted to increase its capitalization in proportion to the increase in the value of the lands, brought about by the funds invested in the railroad.

In addition, the public utility property must continue its operation and serve the public even though its expected earnings are not realized, and if it cannot pay its fixed charges (interest on bonds) the court intervenes, assumes charge, and continues to operate the property for the benefit and service of the public, and this is necessarily so and right, and no corporation can dispute it, but the fact remains, however, that in such cases the original investor is generally a heavy loser and the property is rebuilt, if necessary, out of funds obtained by the receiver, by giving the new funds preference in the distribution of earnings, and the property continues to operate to serve the public.

The original investor has taken the risk and lost through error in judgment, or possibly due to changed conditions, and therefore in a case where the property can be made to earn ten per cent, or even fifteen per cent, after a period of years, is it just or equitable

[1] Abstract of a paper read before the annual meeting of the Central Electric Railway Association, Indianapolis, Ind., January 19, 1911.

that the rate of return to the investor should be limited or reduced to a much smaller amount than the rate on which he originally estimated might accrue to his investment?

The question of physical appraisal has been rather fully covered during the last few years and the writer finds no great difficulty, by eliminating the theoretical ideas, in harmonizing the various practical methods used or suggested in arriving at the present physical value of any property. However, very grave questions arise in the use of any basis of physical valuation to prove the real worth or value of a property. In other words, physical valuation of a property does not establish its worth or value. This holds true whether it be a new interurban electric railway which does not earn more than operating expenses, nothing towards interest, or a railway operated and maintained in first-class physical condition and earning a substantial surplus above fixed charges.

What is the worth of a small suburban electric railway which cost to construct and equip, say, $400,000, several years ago, and which has never earned its operating expenses; in fact, requires about $10,000 per annum new funds to maintain operating expenses and repairs and which cannot be abandoned like an industrial?

What is the worth of another interurban electric railway that cost about $500,000 and which produces net earnings of about ten per cent after setting aside a proper amount for depreciation?

Surely the worth of neither property can be based on physical valuation although it is perfectly true that the physical value is one of the many factors necessary to establish its worth.

In the case of a property originally nonproductive during several years of the development period, and perhaps requiring to be reconstructed by investment of new capital, thus duplicating the original investment, before it reaches the time when it can earn interest charges, it has been suggested and approved by at least one of the State Public Service Commissions that a proper valuation would include its duplicate investment or cost of development and also the accumulated deficit capitalized, due allowances being made for charges against interest, depreciation, etc. In other words, it was assumed and granted that the property since it was first constructed was entitled to credit in a valuation to a fair rate of return on the investment from the beginning in addition to a proper amount for depreciation and therefore, if not earned and paid out, the company would be entitled to calculate the accumulated deficit and add the capitalized amount to the valuation.

It will be noted that in all of these cases it is necessary to first arrive at what constitutes a fair rate of return.

Take the case of two steam railroads between two important terminal cities, one road five hundred miles in length with two and one-half per cent grades and many curves serving, say, 250 miles of fair local producing territory. The other road, say, 350 miles in length, with one per cent grades and few curves, serving also 250 miles of equally fair producing territory. Assume that the terminal facilities are approximately equal, or both using the same terminals, and that their present physical valuation is approximately the same. Is the worth or value of each road approximately the same? Is the physical valuation a proper gauge as to the real value of either? Should both roads be held to the same tariff rates between terminals, or should each charge the same rate per ton and per passenger mile for local and through business? Unquestionably the better road is the shorter, direct low-grade line and its worth or value is greater regardless of the question raised as to rates. And justly so, all public utility properties—like private industrials—are entitled to the benefits of good creative judgment, good engineering and the advantages accruing to the utilization of talent in its investment. If this is not conceded, then the government must step in and guarantee a certain and definite return for all such investments alike, whether made with good judgment or otherwise, and manifestly this cannot be accepted nor would it be prudent or advisable.

VALUATIONS.

The principal methods used in valuations of properties are:

(1) Valuation based on the earning power. This basis is generally used in the purchase and sale of properties between private interests. It was also used largely by the European government in taking over private steam railroads. It was also advocated and approved by the United States Federal Government in the franchise granted to the Manila Electric Railway wherein the term is for fifty years, but, at the expiration of twenty-five years, the Municipality may acquire the property on a valuation fixed by net earnings. The Supreme Court of the Islands is Referee. A valuation based on the earning power will depend entirely on the percentage rate used in arriving at the capitalized value, and is also directly dependent on the tariff rates in vogue. In other words, a property operating under high tariff charges would have a high valuation and one operating under low tariff charges would have a corersponding decreased valuation. It will therefore be seen that this method of valuation cannot advisedly be used as a basis.

(2) Valuation based on market value of securities. Used by Prof. H. C. Adams of the Interstate Commerce Commission in arriving at a commercial value of railroads for the Census Bureau. This method will appeal practically to business men as indicating a commercial going value, but it should be noted that the market value of securities depends largely upon the earnings, and the earnings depend very largely upon the tariff rates in vogue, so that such a valuation may be directly affected by either a proposed, or actual, change in tariff rates and is also subject to speculative movements. This basis of valuation, however, generally reflects, in a measure, the probable future growth both favorably and unfavorably.

(3) Valuation based on original cash cost of organization, construction and development. Less depreciation and plus appreciation. This method has great merit in arriving at a fair valuation of the property on which to calculate a reasonable rate of return commensurate with the original and subsequent risks. Such a valuation should include all cost of organization, construction and development of the property.

(4) Valuation based on the cost of reproducing the property new today. As if a new company were to construct and operate it. This basis of valuation has certain merit, but is considered not so equitable as No. 3. If used, the valuation should include all estimated cost of organization, construction and development.

(5) Valuation based on an inventory of the physical property at estimated cost of production less depreciation and plus appreciation. This method is that usually employed by appraisers and its results depend very largely upon the personal equation of the men directing the appraisal and the previous experience of the staff employed. Its errors are principally of omission. In cases where costly changes and previous reconstruction and obsolescence of the property cannot be shown on any inventory, all of which are a necessary part of the "cost of development of the property," the question as to whether any or all of such items should be included will depend upon whether the additional expenditures have been provided out of new capital or from surplus earnings above interest charges and dividends on the original investment. A complete and accurate inventory should undoubtedly be made by every corporation as a record and information on which to gauge amounts necessary for depreciation, adequate protection by insurance and to show the relative physical equity back of the bonds which is of importance principally to the purchaser of the bonds. All things considered, it is not so reasonable, reliable or fair a basis, except for limiting a bond issue, as outlined in method No. 3.

PHYSICAL PROPERTY VALUATION.

The experience obtained in the appraisals heretofore made by various engineers, commissions and corporations has been valuable in the present consideration of the subject. The results obtained, however, have not been uniform, due, not only to wide variation in personal equation, but, also by including in some appraisals items which are excluded from others.

It is therefore advisable to consider what should, and what should not, be included in the appraisal of the physical property.

(1) Legal expenses, including that for right of way, franchises, permits, organization, construction, etc.

(2) Cost of promotion, covering expenses of preliminary investigations and reports, preliminary surveys, expenses conducting a large number of possible investors, local authorities and others over the line, in addition to the legal expenses.

(3) Brokerage expenses for securing the necessary funds during the construction period.

(4) Interest, or carrying charges, on all money expended up to the time the property goes into complete operation.

(5) Engineering and supervision.

(6) Total cost of construction, including contractors' profits on material and labor.

(7) Total costs of right of way.

(8) Accidents and damages, including all insurance premiums, fidelity, casualty, fire, boiler or other insurance and allowances for contributions to charitable and hospital funds.

(9) Cost of complying with conditions of franchises, etc.

(10) Overhead charges, including management, office rents and supplies.

(11) Working capital.

(12) Costs of organizing the business, securing customers, testing out entire plant and drilling new men for operating.

(13) Cost of marketing and discount on the bonds (considering it as part of the price or cost at which money can be secured from the sale of the bonds).

(14) Contingencies—to cover incomplete inventories, unforeseen difficulties of construction and other items of expense which can not be foreseen.

(15) Obsolescence.

(16) Replacements and betterments —made out of new capital investment.

(17) Loss in the early operation during the period of development.

Item No. 17 would be eliminated if proper consideration and margin is allowed in arriving at the percentage of return on investment—commensurate with the original and subsequent risks of capital—for in such a case the investor assumes all such possible losses at the time he considers the estimated probable return and the basis and terms upon which he makes the investment.

FRANCHISE VALUATION.

The question as to whether or not the franchise should be appraised and included in the valuation of a property has been the subject of considerable discussion and argument. Personally the writer feels that if any equitable plan of valuation can be made acceptable to all concerned without including a value for the franchise, it would be desirable, for it would immediately eliminate strong public opinion which undoubtedly stands against crediting public service corporations with a considerable value obtained by grants from the public, and therefore it is highly desirable that we should make analytical study of the conditions in order to suggest a plan, if possible, that would eliminate the value of the franchise from necessary consideration.

The usual basis of capitalizing the net earnings and then deducting the total physical valuation to determine the value of the franchise, is not stable, or entirely satisfactory, for the value thus determined varies with the increase or decrease of operating expenses, taxes and tariff rates and does not take into account depreciation or sinking fund, nor the difference in total physical investment and operating expenses, directly due to franchise stipulations and requirements.

Manifestly on a basis of net earnings capitalized, some franchises may have a negative value, also such value would depend directly upon the percentage rate used in capitalizing the net earnings and thus, by a comparatively small variation of this rate, the franchise value can be made large or small.

Some court decisions have recognized that what gives value to a franchise is the capital invested in the property thereby making the earnings possible, and giving to the public the conveniences and facilities desired.

In the case of an interurban electric railway, the value of its franchise might be considered on its economic basis compared with the line if built on a private right of way. The original comparative investment can be readily computed and against the increased cost in private right of way would be the saving in operating expenses and particularly the costs of maintaining tracks in city streets, pavements, and the expense of complying with other stipulations of the franchise, together with the additional expenses of accidents and damages on streets, all of which, when capitalized, will often more than offset the increased cost of entrance over private right of way. In addition there are items which should be credited, such as increase of traffic, due to increased speed, and the right to charge a reasonable fare of, say, two cents or three cents per mile instead of being limited to a five-cent fare for any distance with or without transfer. In such cases, it is quite possible that the franchise value to operate on city streets may be nil or even negative.

The value of the franchise is generally offset at the time it is granted by the stipulations and conditions im-

posed. Of course, after a term of years, its value may have greatly enhanced, and, therefore, it is reasonable that the term of expiration be limited with possibly a renewal stipulation on a new basis of compensation to the city.

LAND VALUATION.

The great difference of opinion between the various public service commissions as to the proper basis for valuing railway right of way, freight yards, and terminal real estate is sufficient reason for non-dependence on pure physical valuation for taxing or rate-making purposes.

Today, the value of the land used by many of the larger railroads in cities has increased more, by its location, continuity and use for traffic purposes, than the value of adjoining real estate. On the other hand, the value of adjoining land in new and sparsely settled territory has increased, perhaps over 1,000 per cent, due to the construction of railways and, therefore, it must be conceded that a railway is justly entitled to participate to some extent in the increased value of its property (not created by increased tariff rates) and, unless public service corporations are permitted to participate to some extent by profits in operation beyond and above the usual return on guaranteed invested capital, there must be a halt in the progress and development of the country dependent on the construction of new lines and extension of existing railways.

CAPITALIZATION.

In calculating the valuation of a property on the basis of capitalizing the net earnings, the whole question depends upon the rate used in capitalizing, and thus enormous differences in the results are obtained by only a slight change in rate. Many official appraisals have been made on a basis of five per cent capitalization of net earnings, whereas, but few investors would consider the construction of any public service property if but five per cent could be expected as a return, inasmuch as no minimum return is guaranteed.

The capitalization of a property should not be limited to the actual investment in the physical property or by the net earnings capitalized on a five per cent or six per cent basis. The only equitable basis is first to consider and determine the estimated rate of return that the original investor expected, and that new capital would require. It is manifestly unfair to hold the total capitalization to the appraised physical value on existing property as new capital cannot be secured on that basis, nor did the original investors undertake the business with that understanding.

Also it is unreasonable to limit the capitalization to the net earnings capitalized, for it would be a hardship on properties earning but a small margin above operating expenses, although they may be well serving the public and in a growing territory that will produce large net earnings in succeeding years, therefore, such a method of controlling capitalization would be very objectionable—going up and down as earnings increased or decreased. It would also mean higher capitalization if tariff rates are increased, and *vice versa*, giving too great a latitude to public utility properties. As a matter of fact, capitalization does not govern the making of tariff rates.

The high capitalization per mile of many steam railroads includes large investments in other railroads, and therefore, the real capitalization per mile is much less than usually recorded.

It has been suggested that if we would use the term "shares" instead of stock, it would indicate more properly that the shares are issued only to form a convenient way of sharing in the surplus earnings, for which shares were issued without carrying any par value, such as the shares or interest held by the individuals comprising a partnership, the question of watered stock would be eliminated, and the surplus would be divided, if earned, as between the number of shares authorized—not as any rate per cent, on an assumed or fictitious par value.

Although shares or stock may carry its par or dollar mark, for perhaps years, it is nevertheless helpful, in analyzing the situation, to regard shares merely as a division of surplus earnings into shares or parts and, in which case, it matters not how many shares are issued. Publicity, on a basis that will be intelligible to the general public and in simple and unmistakable form, will protect the innocent public when it wishes to invest, and in cases of consolidation of companies, each having bond issues and capital shares, it cannot be denied that there should be some positive regulation preventing the issuing of consolidated bonds against common shares of underlying companies where such shares originally did not represent cash invested in the property, and companies who have advocated such methods will continue to reap the censure that they deserve.

SECURITIES.

Proper supervision and regulation of the issuance of securities in any public service property, or by any incorporated company for that matter, is advisable. Probably the best regulation that could be affected would be adequate and intelligent publicity, and limiting or controlling the issues as follows:

Bonds against the cost of organization, construction and development, at the price sold, allowing for the usual discount and commissions, but limited to the estimated net earnings, until earnings increase sufficiently to carry the entire authorized bond issue.

Stock (a) as preferred shares, representing that portion of the cost of organization, construction and equipment which is not covered by the bond issue.

(b) As common shares, without carrying any stated par value—representing the basis of subdivision for the distribution of estimated expected profits.

OPERATING EXPENDITURES.

This field has been left almost entirely with the operating management of corporations who have endeavored, with varying success, to keep down the operating expenses to a minimum, and Public Service Commissions have had but little to say in matters of management excepting in so far as requiring adequate and improved facilities and safety devices, in cases where they were thought to be needed, have affected operating conditions and costs. They probably realize, however, that many of the companies may reduce operating expenditures by a more careful study of conditions and reasonable charges in operating details.

The shippers have recently gone somewhat into this question, in their case of opposing the increase of freight rates by the steam railroads, and from an independent viewpoint the writer believes it would pay many of the corporations to go very carefully into the methods and costs of operation, by the employment of experts with experience not only in railroading, but also those

familiar with outside systematic management and development of industrial methods, from a worldwide study of conditions, and then adopt the practical methods which could be shown would reduce operating costs. Not only would such companies thereby secure the benefits of advanced practical methods, adapted to every detail of their business, but such efforts to cooperate in reduction of costs would obviate the desire for, or necessity of, detailed direction, by Public Service Commissions in operating details.

The management of American Roads is entitled to great credit for the economical results already produced. (a) Today the average freight rates per ton mile obtaining in the United States are lower than in any other country in the world. (b) The wages paid by American railroads are higher than in any other country in the world. (c) The cost of materials and supplies constituting a large part of the maintenance and renewal expense is fully as high, if not higher, than in any country in the world.

TAXATION.

Probably one of the principal reasons of the public demand for valuation of public service properties has been an endeavor to secure a larger tax return from the corporations, and investigation shows that there exist great differences of opinion between the State authorities, both in theory and in practice, as to the best basis for taxation. The taxing of public service properties has grown out of a common method of valuing and taxing real estate and property, and the time is now opportune for a uniform change to a more satisfactory and equitable basis, as it is generally agreed that there should be a universally approved standard based upon logical and reasonable principles.

If the purpose of desiring to determine a value for the franchise is to establish a basis for taxation, it would seem reasonable that a tax based on a certain percentage of the gross or net earnings would be more equitable. In Manila, where a franchise was granted under the approval of the United States Federal Government, the percentage of gross receipts to be paid the municipality was incorporated in the franchise and provided that the "Grantee is to pay usual taxes on real estate, plant, machinery, and on personal property, not including road bed, track, rolling stock, poles and wires. Also, two and one-half per cent of its gross receipts, which shall be in lieu of all taxes and assessments of whatsoever nature and by whatsoever authority upon the privileges, earnings, income, franchises, road bed, track, rolling stock, poles and wires of the grantee, from which taxes and assessments the grantee is hereby expressly exempted."

This was virtually the first Federal regulation of Public Utility Properties. This franchise has proven very satisfactory to the Government, the Public and to the Company, and has solved the perplexing subject of taxation and eliminated the several separate and indefinite taxes.

Corporations and investors would not so generally object to paying taxes if a method and basis were adopted that would be uniform and definite. What capital fears most in the matter of taxation is the uncertainty of how a corporation will be treated by the tax assessor and the various taxing authorities. It is, therefore, to the advantage of the public, the Government and the corporations to simplify and adopt a uniform method for taxation, and it is believed that a percentage of the gross or net earnings would be the most equitable and satisfactory.

TARIFF RATES.

Rates primarily considered should be made upon the value of the services rendered.

This would not limit the earnings of a well located and properly developed property economically managed to the same rate of return that can be earned by a poorly located and undeveloped property operating under the same tariff charges.

Should the rate of return on a good property be limited, by means of a reduction in tariff charges that could not be accepted by the poorer property without manifest great injustice?

The reasonable basis would be to permit the good property, that supplies superior service, to charge relatively higher rates between the same terminal points which would throw the better or higher class of business to the good line and thus permit the poorer line to receive a larger portion of the total business. Such a plan should be acceptable to both properties if worked out on an equitable basis. The principle of equal rates for equal service would remain, but would be supplemented by an additional charge for quicker and more convenient service. This is already partially appreciated in the matter of passenger rates and service between New York and Chicago, which has proven more satisfactory, to both the poor and high class lines, than the use of equal rates. The same differences might also be applied with good results to certain of the freight tariffs.

GOVERNMENT OWNERSHIP—GOVERNMENT OPERATION.

When the individual citizen is prepared to do as well for the Government as for his own personal gain, we may then expect to get economical results from Government ownership and operation. We will know when that time has arrived when everyone voluntarily walks up to the tax department and declares every penny of taxable property, and when the Customs Inspectors are no longer required at the docks of incoming steamers carrying returning American tourists. Are not corporations, as a rule, fully as honest as the individual?

Government ownership and operation is now practical in the few cases where the operating details are simple, and involve the employment of comparatively few men, and without complex machinery and operations not requiring a large technical staff, such as a city water works or sewage system, where the interest on the investment is the largest item of continued expense. But for the operation of steam and electric railways, gas and electric lighting or similar properties, an efficiently organized corporation can produce far greater and more economical results than can be secured by Government operation. Indeed, it has often been asserted by competent economists that the Postoffice Department could be managed much more economically by a corporation, and on a basis to produce a large profit instead of the present deficit, yet other considerations such as security, and fidelity to all interests alike, make it inadvisable to even suggest such a change; and, in fact, the extension of the service to include parcel post is probably advisable, being in line with the general demand of the people for better and increased facilities.

Government ownership, with operation by private corporations, is probably

much nearer realization. The fact that interest charges, on funds raised from the sale of government securities, is much less than if capital is obtained privately, is a strong argument in favor of the employment of government funds for the construction of public utilities if it can be done on a safe and reasonable basis. A satisfactory instance of the employment of Municipal funds for construction and ownership, but for private operation, is that undertaken by the City of New York in the construction of the existing subway system which is operated under lease by the Interborough Company.

Where government bonds are sold to supply funds for the construction of a public utility, the purchaser recognizes that the investment is safe and there is absolutely no risk. The interest is certain to be paid on the day stipulated, whether a profit is earned from the operation or not. The principal is also secured, and the additional fact of the ready marketability of the securities is a greatly appreciated feature, for an investor always considers with more favor a security that can be sold without effort.

The employment of Government funds for the construction of public utilities to be operated by private corporations is possibly the most economical plan to secure the construction of large public utilities. It largely eliminates the question of valuation of the property as affecting the corporation, and the question of taxation is solved by fixing percentage of the gross or net earnings, as is recommended by the writer in cases of private ownership. However, the enormous funds required and the additional liability that would be incurred by the Government—naturally depressing the credit of the Government—makes it desirable for the continued employment of private capital in the great majority of public utility properties.

SHIPPERS.

The shippers are responsible to a very large degree for the conditions that are now regarded as unsatisfactory as to tariff rates on steam railroads. The competition between cities, and also waged by jobbers and wholesalers as well as manufacturers, has brought about differentials in rates which are equivalent to large rebates.

HIGH COST OF LIVING.

The high cost of living, including the necessities of life as well as some luxuries, has undoubtedly added to public discontent, and looking for causes, the public utility properties have been blamed without a proper study of the underlying facts and conditions. It will be interesting if capable economists will investigate the cost of food products and manufactured articles covering the necessities of life from the farmer (and from raw materials) to the consumer.

The following has been noted from data published in the year 1910:

The Florida farmer receives for one bushel of green beans	$2.25
The railroad receives for an 800-mile haul	.50
Total cost to point of delivery	$2.75
Consumer pays	6.40
Leaving for the middleman and retailer	3.65=57%

of the total selling price, whereas the farmer receives 35 per cent of the selling price and the railroad but eight per cent.

In the item of eggs, the farmer receives an average price of fifteen cents per dozen; the railroad for transportation receives two cents per dozen—the total price to point of delivery, seventeen cents per dozen. Consumer pays—average price thirty cents per dozen, leaving for the middleman and the retailer thirteen cents per dozen, which is equal to forty-three per cent of the selling price—whereas the farmer receives fifty per cent of the selling price and the railroad but seven per cent.

During the recent rate proceedings instituted by the shippers against the railroads, it was shown that a fair example of the proposed increase in rates would be equivalent to one and one-half cents on a pair of shoes, yet it was intimated that this increase would probably amount to twenty-five cents per pair of shoes to the consumer, which illustrates conclusively that railroad rates are not responsible in any appreciable degree for the present high cost of living.

REGULATION.

In this connection, I desire to quote from a speech by Martin A. Knapp, then chairman of the Interstate Commerce Commission, at a banquet given in the city of New York, November 22, 1910 (from New York *Sun*, November 23, 1910):

"That the compulsion of competition among the carriers is an unwise and mistaken policy I am persuaded. It is out of the question to have the presence of competition and the absence of discrimination. Just so long as competition between carriers is unrestrained, just so long will it result in policies which are dangerous, for to compete is to discriminate. It is fallacy to condemn discrimination and at the same time to insist upon the very policy which promotes it. * * *

"I am not sure that the government regulation of railroads has passed the stage of experiment. I can see many elements of doubt. There is always the intense friction of commercial rivalry and over all is the sinister shadow of party politics and ambitions.

"If our country is to grow and prosper as it ought, if its untold resources are to be developed and its swelling numbers find profitable employment, we need and must have railway earnings sufficient for three things:

"First. A return on railway investments of such amount and so well assured as to attract and secure the necessary capital—an enormous sum in the aggregate—to improve existing roads and to construct without delay thousands of miles of new lines in fruitful districts now destitute of any means of transportation.

"Second. The payment of liberal wages to an adequate number of competent men. This not only to insure increasing skill and reliability in a service which is all the while becoming more exacting and on which the safety and comfort of the public constantly depends, but also because of the very great influence of railway wages upon the compensation of labor in every sphere and grade of private employment.

"Third. The betterment of existing lines so as to greatly augment their serviceableness to the public, as can in varying degrees be done everywhere, without unnecessary and undesirable increase in capitalization. Every dollar borrowed to improve a road now in operation involves a permanent addition to the interest charge which the public is required to pay; the improvement from current earnings puts no lien upon the property, but rather augments its value and usefulness, and by adding to the security of the capital already invested tends to a lower rate of interest upon that capital."

The general question of regulation has not been sufficiently well considered by the public at large, but it is earnestly hoped that everyone will take the time and interest to get at the basis and truth of the entire question.

CONCLUSIONS.

There is, unfortunately, a lack of analytical knowledge on existing properties as to the real investment, accumulated deficits, actual depreciation, betterments and extensions made from earnings—or perhaps never earned and covered by additional capital, the real cost of the development of traffic, the appreciation of rights of way and terminal facilities, the question of obsolescence and rapid advancement in the arts and methods involving great expense to the corporation, the determining of the original and subsequent risks on capital invested, the rights and facilities expected by the public, the services actually rendered by the company and the cost thereof, the question of improving the service and the increased or decreased cost thereof, also other relevant matters, all of which have, in whole or in part, important bearing upon the difficulties confronting the equitable settlement of the general questions now being dealt with by the various Government Commissions.

It is extremely important to public utility corporations that they study and analyze the creation and development of their properties, and prepare comprehensive and complete schedules showing the valuations, both physical and otherwise on an equitable and logically correct basis, also analyze the questions of the service rendered and the costs of operation and thus be prepared to demonstrate the true and correct position of the company. In some cases, such an analysis may suggest changes one way or the other in the capitalization, management or tariff rates, and the information would not only be valuable to the corporation, but would also enable the Public Service Commissions to arrive at more correct conclusions regarding the position of the company.

Intelligent and adequate publicity would be of the greatest aid to the corporations as well as to the public and the Government Commissions, for it is proper that the public and investors be correctly informed as to the actual condition and position of the company, including economy of operation and costs of improved services demanded as affecting tariff rates, and it would unquestionably be to the advantage of the corporations to adopt, wherever practicable, applications of scientific management and efficient engineering.

It is important to the public that nothing be done to destroy, or take away, the incentive for a reasonable return or profit commensurate with the original and subsequent investment risk.

The logical basis for valuations and for a complete and intelligent understanding of a property should cover in sequence:

(a) The fair rate of return or profit commensurate with the original and subsequent risks.

(b) The total cost of organization, construction and development of the property, less depreciation and plus appreciation.

(c) An analysis of operating expenses, depreciation and obsolescenec.

(d) The question of taxation—method, or basis, and amount.

(e) The fixed charges—interest on bonds and other indebtedness.

(f) Amortization and surplus—based on present, also probable future, requirements.

(g) Final determination of tariff rates, to be based principally on value (including costs) of services rendered.

It would be highly advisable if a uniform method of taxation could be adopted, to be based on a percentage of the gross or net earnings.

Bonds should not be issued in excess of the cost of producing the property from the proceeds of their sale, and to be further limited to an amount during the development period on which the net earnings will pay the interest charges and depreciation.

Preferred stock to be issued to cover the cost of producing the property if not covered by the bonds.

Common shares to be issued in any reasonable amount desired by the corporation, but without indication thereon of any par value.

Report on Railroad Electrification at Boston.

The road to steam-railroad electrification appears to be as full of obstacles in Boston as in Chicago, judging from a report submitted on January 30 to the Legislature by the Joint Board on Metropolitan Improvements. This board, composed of the Railroad, Harbor and Land, Boston Transit and Metropolitan Park Commissions, was required by a law passed about a year ago to investigate a large number of improvements proposed for the Boston territory, including the electrification of all the standard-gauge railroad lines entering the city, and to report a bill to the Legislature of 1911 providing for the completion of the work by a given date. The law has been fulfilled by the Joint Board, but with the recommendation of nine of the sixteen members that no legislation be enacted at present, and that the railroads be left to work out the problem in their own good time. The principal argument appears to be that the estimated cost of the work, about $40,000,000 is too great to justify the State in forcing the abolition of the steam locomotive.

The recommendation is made, however, that a tunnel be built between the two great railroad stations at the north and south sides of Boston, with electrical operation presupposed. If this is done, the gradual extension of electrified service will follow as a matter of course. Sooner or later the policy of the New Haven Lines in pushing electrified service eastward from New York City to New Haven will necessitate similar steps at Boston. The Joint Board takes the ground that there is already plenty of national and state regulation of public utilities, and urges that the methods of electrification are not yet sufficiently standardized to warrant the cost. Further, it is almost certain that suburban passenger rates would have to be raised to pay the cost of electrifying.

The minority of the Board, on the other hand, believes that the report of the majority tends to unduly discourage and postpone electrification, even by the voluntary action of the railroad companies. A portion of the minority favors immediate legislation, and the rest favor a continuation of studies by the railroads and suitable state tribunals, until the work can properly be done. Those in favor of electrification cite the work already accomplished at New York as an example of successful development, and point to various utterances of responsible railroad officers on behalf of active steps in that direction for Boston.

CENTRAL-STATION PRACTICE

Transmission—Interior Wiring

ELEMENTS OF POWER-STATION DESIGN.—XXI.

DISTRIBUTING SYSTEMS.

BY W. B. GUMP.

A system of conductors for the distribution of electrical energy includes all secondary circuits, and is so closely allied to the generating apparatus as to be more or less a part of it. In order to deal comprehensively with feeder systems it is advisable, therefore, to include a portion of the substation layout, and lead on through the electrical network to the consumer.

The previous chapter dealt with the general character of substation design, laying particular stress upon the choice of transforming apparatus. The present description is to deal especially with the factors contributing to the utilization of energy beyond the substation switchboard, taking up in proper sequence, the following items:

(a) Applications of alternating and direct current.

(b) Relative weights of copper conductors.

(c) Two-phase *vs.* three-phase systems.

(d) Transformer connections.

(e) General design of feeder systems.

(f) Regulators and auxiliary devices.

(g) Outside construction and maintenance.

(h) The financial side.

(*a.*) *Applications of Alternating and Direct Current.*—For general lighting and power the use of alternating current predominates. The application of direct current is restricted mainly to railway operation, and isolated lighting and factory plants. Since tungsten lamps are being introduced for street lighting in many places, alternating current is continuing to hold its own, both with and without the use of the constant-current transformers. Continuous current for department stores, and in the smaller systems has recognized advantages, especially in conjunction with a storage battery. Aside from such applications it is not generally feasible, the chief objection being the high cost and constructive difficulties involved in its transformation.

(*b.*) *Relative Weights of Copper Conductors.*—The weight of conductors, and hence their cost, is vital to the economic distribution of power: therefore it is necessary to make a close observation before deciding upon the system to adopt. It will be assumed in the following comparison between different systems that the single-phase system is unity, and equal to a continuous-current system of the same voltage, length and output, and that the line loss is to be the same.

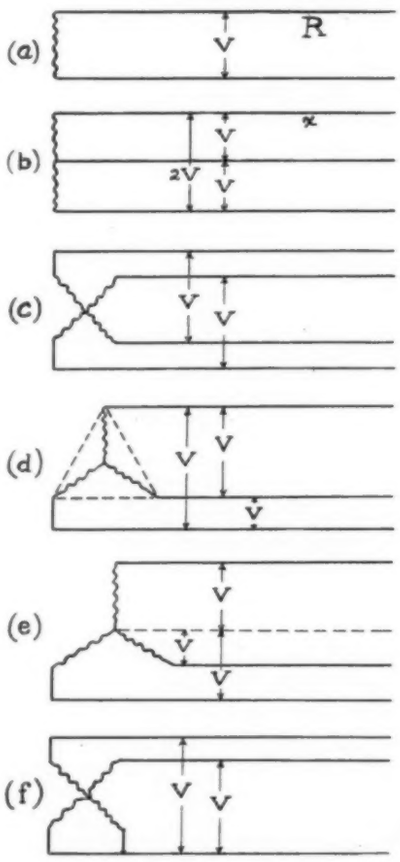


FIG. 1.

Considering first a three-wire direct-current system similar to Fig. 1 (*b*), it will be seen that a saving of 62.5 per cent is effected in cost of conductors. This is derived thus:

Let I = current in two-wire line,

V = potential of two-wire line,

R = resistance of one wire in two-wire line,

x = resistance of one wire in three-wire line

Then $I/2$ = current in three-wire line.

Equating the line loss in one wire of each system, we have

$$I^2R = \left(\frac{I}{2}\right)^2 x$$

$$x = 4R$$

The weight of copper is therefore as one to four for a single wire, or three to eight for the entire circuit. Hence for a three-wire system the weight is reduced 62.5 per cent below that required in the two-wire system, either alternating or direct, having the same output. It may actually be further reduced, as the middle wire does not carry the full current.

A five-wire system, formerly used to a limited extent, may be shown to require only 5/32 of the weight of a two-wire system. Expressing the equation

$$I^2R = \left(\frac{I}{4}\right)^2 x$$

$$x = 16R$$

or the total weights of copper are as 5 to 32.

It is interesting to note the fact that while a vast reduction in copper results from this system, it is clear that either four machines, or a special five-wire generator, must run continuously. Since economy demands a high load-factor it would be poor policy to have a large capacity inoperative through long idle periods. Such a machine demands excessive maintenance, and therefore offsets the saving in copper.

Observing next the two-phase system, Fig. 1 (*c*), it will be evident that we have the equivalent of two single-phase circuits, each of half the capacity of one single-phase, as in (*a*), or the same

weight of metal as in one single-phase circuit the same capacity, voltage and length.

The three-phase three-wire system saves 25 per cent of copper, or requires 75 per cent of the weight of conductors of a single-phase or a two-phase system. This may be analyzed as follows.

Referring to a balanced three-phase system, as (*d*), Fig. 1, it will be remembered that this is the equivalent of three separate single-phase circuits, making six conductors. Since the resultant of the simultaneous voltages and currents respectively is zero, no return wires are required. The total power being P,

$$P = \sqrt{3}\, V I_1 = V I$$

where $I_1 = I/\sqrt{3}$ = current per phase.

the previous maximum potential, we have a current $\sqrt{3}$ as great, and the resistance may be three times as great, or the weight of copper one third. Referred to a single-phase system we have:

$$weight = \tfrac{1}{3} \times \tfrac{3}{4}$$

or 25 per cent the weight of single-phase conductors.

If the neutral of a four-wire three-phase is used, having the same cross-section as the outer line conductors, we obtain .0833 more weight, which requires 33.3 per cent of single-phase system. With a neutral of but half the cross-section the weight becomes 0.292 weight of single phase.

The two-phase three-wire system, Fig. 1 (*f*), is unbalanced, and is so inferior to the three-phase system that it is not recommended. The three-phase three-wire system requires (75—72.8)/75 = 2.9 per cent more copper than the two-phase three-wire, having the same voltage between outer lines and neutral. This saving is of small consequence compared to the advantages of the three-phase system.

(*c*) *Two-Phase vs. Three-Phase Systems.*—The derivations last given lead to the question of two-phase *versus* three-phase distribution. This question has necessarily received a great deal of attention. At the present time, however, there seems to be less room for discussion than that existing a few years ago. Two-phase transmission has been rather extensive, and not until recently has the three-phase found universal favor. The chief cause of the introduction of the two-phase system is accounted for by the fact that balancing within the generator is more easily secured. Recent progress in three-phase transmission and distribution has eliminated most of the difficulty, and at present the advantages are less on the side of the two-phase system than the three-phase.

The chief disadvantage of two-phase distribution (or transmission) is the extra cost of line conductors and insulators, since four wires are required, and the same amount of copper as single-phase, as previously noted. One distinct advantage of two-phase is to be found in shop installations where induction motors are used. In such a system the auto-starters may be entirely eliminated, thereby reducing the first cost of the installation, and the cost of maintenance. The elimination of auto-starters is brought about simply by in-

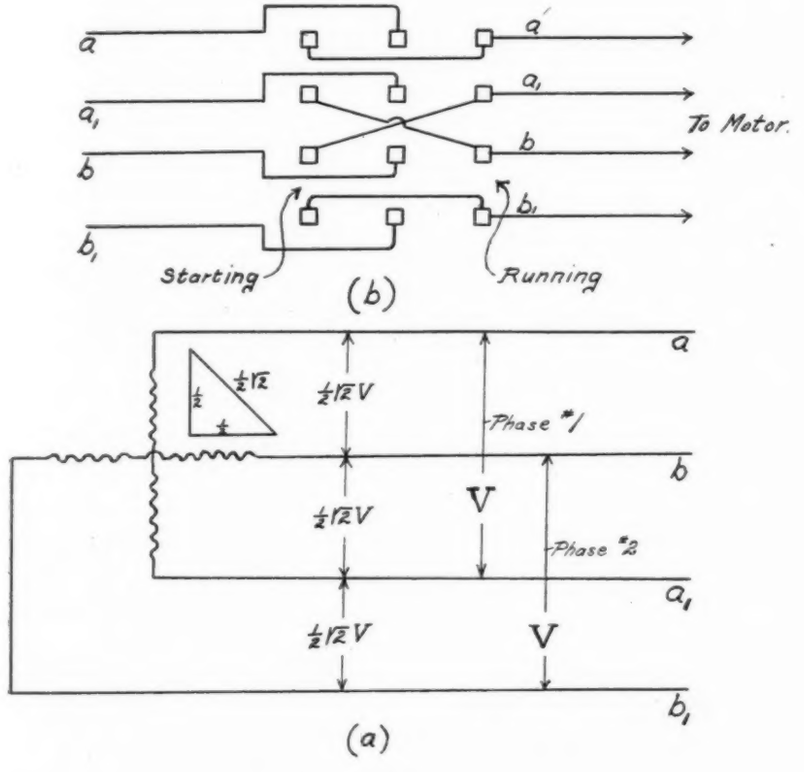


FIG. 2.

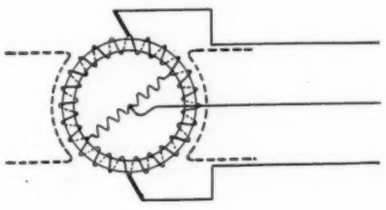


FIG. 3.

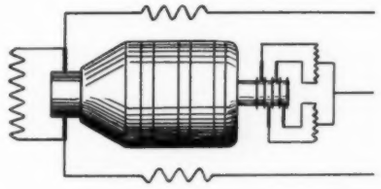


FIG. 4.

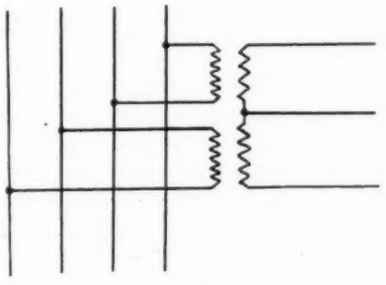


FIG. 5.

$$2\, I^2 R = 3 \left(\frac{I}{\sqrt{3}}\right)^2 x$$

$$x = 2\, R$$

The weight per conductor is one-half; in other words, each conductor of the three-phase system requires one-fourth of the total weight of the single-phase, making a total of 75 per cent, for a complete three-phase system.

If we consider the same potential V between any line and the neutral, as in (*e*); that is, a three-phase system whose potential to the neutral is the same as

terchanging the connections of the line wires on the starting side of the switch, and thus utilizing seven-tenths of the maximum potential, which is the potential between phases. To illustrate, observe the diagram in Fig. 2 (*a*). Here, it is clearly seen that the potential between phases *a* and *b* is 0.7 the potential across either phase. A starting device may therefore be connected as shown at (*b*). The diagrams are self-explanatory.

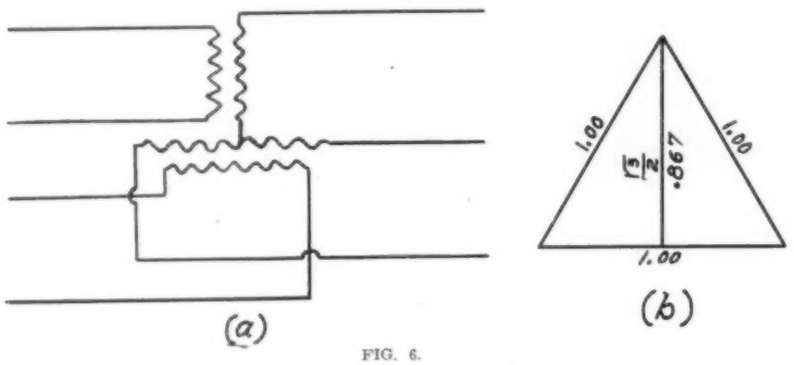


FIG. 6.

(*d*) *Transformer Connections.*—Under the heading of transformer connections it is well first to describe the action of the continuous-current three-wire generator, since it figures prominently in a good many distributing systems. The general scheme of operation is shown in Fig. 3. The neutral wire is connected to the middle of a balance coil in a manner similar to that of an auto-transformer. This coil is wound upon a laminated iron core.

It has been found in practice that two balance coils work to better advantage than one. These are each tapped at their middle points, and the taps joined, and connected to the neutral. More complete connections are shown in Fig. 4. Three of the slip-rings may be eliminated by carrying the balance coils within the armature instead of installing them outside. The latter method, however, has three distinct advantages. One is a less massive armature than that required with self-contained balance coils. The second advantage is that the balance coils may be oil insulated, and placed in any convenient location. The third advantage is ease of inspecting and repairing.

Rotary Converters.—The alternating-current side of a three-phase rotary converter has approximately 0.612 that of the direct-current voltage, so that the low-tension side of the step-down transformers to convert to 500 volts direct will have an alternating potential of 310 volts. Six-phase rotaries are used to a considerable extent in railway work, as they are more efficient than three-phase machines. The higher efficiency is due primarily to the fact that the copper loss between taps is reduced.

Alternating-current transformer connections are of a great variety; yet those commonly used are comparatively simple, and the relations of potential and current are not difficult to remember. They are so important that the writer believes they deserve a description. The description herein given is intended to be convenient for reference.

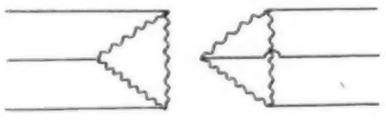


FIG. 7.

The simplest connections are those of the auto-transformer, which is too well known to require description. A three-wire two-phase system is connected to a four-wire two-phase as in Fig. 5. The current of two separate transformers is combined by connecting the secondaries in parallel.

One of the most useful schemes of connecting transformers for changing from two to three-phase, and *vice versa*, is that devised by C. F. Scott. This is used extensively in some of the older two-phase systems where three-phase power lines are desirable. The general scheme of connections is given in Fig. 6, (*a*), in which one secondary lead of one transformer taps into the middle of the other secondary. Diagram (*b*) makes clear the fact that one transformer requires but 86.7 per cent as many turns as the other, or $\sqrt{3}/2$ times maximum secondary voltage. Such an arrangement demands two sizes of transformers, or else facilities for bringing out taps at the proper points. The latter scheme is the one usually adopted, as it makes the two transformers interchangeable. Where it is found necessary to employ two regular transformers not provided with taps a method of boosting or bucking must be used. This is accomplished by means of a third transformer. Considering two transformers whose secondaries are identical, it becomes evident that the potential of one of the secondaries must be suppressed or bucked by 13.3 per cent of the secondary voltage in order to reduce its voltage to 86.7 per cent.

Since three-phase transmission and distribution is almost universal, it will be discussed extensively. The first question which will arise in planning a system is what method of connections to use. There are four general schemes, namely: (1) Delta to delta; (2) Star (or Y) to star; (3) Delta to star; (4) Star to delta.

The greatest advantage of the first method, for both primary and secondary, lies in the fact that an interruption to any transformer is confined to that particular transformer, and does not interfere seriously with the operation of any of the phases. This is of great importance where continuity of service is imperative. In the event of an accident to one transformer, the two remaining will each carry 50-per-cent overload to make up for the total three-phase capacity, or each will take 16.7 per cent of the total output, above their rating. The normal potential strain between one line and ground is 58 per cent of the line voltage.

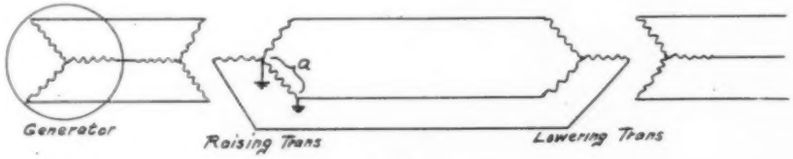


FIG. 8.

The star-to-star connection has the advantage of requiring only 58 per cent as much copper as the delta, having the

same voltage between lines, and the same output. The potential strain between one line and ground is the same as in the delta; 58 per cent of the line potential. That is, under normal balanced conditions with neutral ungrounded. However, if a line wire becomes grounded, there is full potential between each remaining wire and ground. In either delta or star it is simply a question of shifting the neutral, or point of normal zero potential, to the grounded line, thus increasing the voltage by the vector quantity added to that existing without a ground.

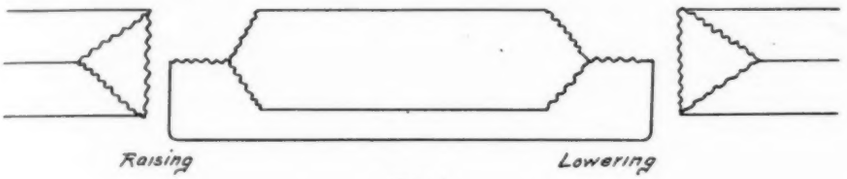


FIG. 9.

Fig. 7 shows the ordinary delta-to-delta connection. For long-distance transmission this method is not usually followed. One serious drawback is that the secondary neutral cannot conveniently be grounded, as is generally desired at some time or other. Its chief advantage is that one transformer may go out, and full line voltage is maintained between conductors, as previously noted.

Fig. 8 shows the star-to-star connection. It is clear that if the neutral is grounded, a ground on one line will cause a short circuit on one transformer, disabling it for the time being. A ground on the line with ungrounded neutral is equivalent to moving the neutral point, or increasing the line potential above ground to the extent of 100—58/58 or 72.5 per cent. A closer analysis of this condition shows the following points: A ground on one of the lines, either primary or secondary, causes a short-circuit of the transformer involved; thus the original neutral becomes shifted from the central position to a position corresponding to an outside line. Therefore a rise of potential takes place, either within the generator or in the external circuit. It is evident that the potential strain between ungrounded lines and ground will be that of full line potential.

Observe next Fig. 9, which shows a delta-to-star, raising, and star-to-delta lowering. This arrangement is common for transmission above 10,000 volts, and in the majority of cases is likely to find fewer serious objections than any other scheme of connections. The scheme shown in Fig. 10, in which the high-tension side of the transformers is delta-connected, is of no particular advantage, under the usual conditions of operation. In this case it is not necessary to ground the neutral of the generators if the low-tension side of the transformers are grounded. If this system is ungrounded the danger which accompanies shifting of the neutral is serious, and may be productive of surges of considerable magnitude. Hence the matter of grounding is of great importance.

(To be continued.)

[EDITOR'S NOTE.—This important series of articles was started in the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN, September 3, 1910, and will cover every phase of central-station design.]

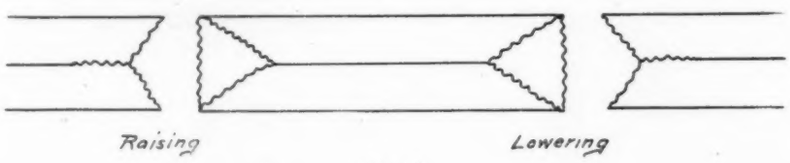


FIG. 10.

Lectures for Central-Station Men.

The Electrical Engineering Department of the University of Illinois is considering the advisability of giving a series of six or eight popular lectures to central-station men of the state. These lectures would occupy two days, and would deal with such practical problems as central-station economics, illumination, and the resuscitation of injured men.

Under central-station economics will be discussed the relative advantages of reciprocating engines, high-pressure, low-pressure, and mixed-pressure turbines, the effect on coal and steam consumption of high vacuum, superheat and boiler pressure.

The lectures in illumination will deal with the comparative costs of different illuminants for exterior and interior lighting. A practical demonstration of the use of the luminometer will be given.

The resuscitation of men will be discussed and practical demonstration will be given with and without apparatus designed for the purpose.

Minneapolis Electric Club.

The members of the Minneapolis Electric Club were addressed by Fred W. Bell at the club's fourth annual meeting, which was held on January 19. Officers of the club are: President, Emil Anderson; vice-president, Fred W. Bell; and secretary-treasurer, Charles W. Arick.

Changes in Pacific Power & Light Company.

A number of changes have been made recently in the personnel of the Pacific Power & Light Company. As previously noted the manager, W. B. Foshay, has resigned to take up work in Vancouver. He will be succeeded by C. S. Walters, who has been local manager of the Walla Walla Valley Railway Company. E. O. Wedge, who has been local manager at Dalles, Ore., has been made superintendent of the company. Mr. Wedge will be succeeded at Dalles by Mr. Bailey, who has been local manager at Pasco, and his work will be taken up by Mr. Andrus, who continues as manager at Kennewick. A. S. Grenier, who has been general manager of the company since its organization, has been made vice-president and J. E. Davidson has been made general manager and will be in charge of operation and new-business policies.

Changes in Electrical Rules, New York City.

Beginning February 1, 1911, the rules and regulations relating to subways, overhead wires and outside work, are superseded by new regulations and rules designated as 12 to 13-A.

Under outside work the new rules deal with wires, trolley wires, pole lines, subways, services, signs, transformers and grounding.

The complete text of the new regulations and rules is given in *The City Record* for January 25 and can be obtained from the Department of Water Supply, Gas and Electricity.

TELEPHONY—TELEGRAPHY, and WIRELESS.

The English Telephone Situation.

The causes of the present situation resulting in the retaining of an American firm of engineers (D. C. & Wm. B. Jackson) to assist the Government in valuing the private system it is soon to take over, date back to 1880, when the telephone first became of practical importance in England. In that year an information was filed against the Edison Telephone Company of London, which was the predecessor of the present National Telephone Company whose property is now to be taken over by the Government. This action was brought by the Postmaster General with the purpose of establishing a rule that telephone communications were to be considered as telegrams within the monopoly of the Post Office and the case was so decided by the High Court of Justice in December, 1880.

Having acquired the right to make telephone service a Government monopoly, the Postmaster General of that day decided that it was not desirable to undertake to provide a new service for the whole country, and in place of that action licenses to carry on the telephone service were granted to various companies. All these licenses have expired, with the exception of that with the National Telephone Company, Limited, whose license was granted in 1884 and holds good for a period of thirty-one years from January, 1881.

This license to the National Company allowed it to transact telephone business of any kind throughout the United Kingdom, but in 1896 the company surrendered portions of its rights by turning over the trunk-line business, or what would be called in this country "long-distance" and "toll-line" communication, to the Government; and retaining the telephone business within exchange areas. Under this arrangement the Postmaster General bought the trunk wires of the company at a price agreed upon between the engineer-in-chief of the Post Office at that time and the then engineer-in-chief of the company. The price was about $2,300,000 for about 14,500 miles of metallic circuit. Since the purchase of the trunk lines the Post Office has carried on all the trunk communications of the country, and has established local exchanges, mainly in rural districts, which the National Company did not provide with adequate service. In 1898 the Postmaster General granted licenses for transacting telephone business to some half-dozen cities, the business in each case being confined to the area in and around the district of the municipal corporation. Three of these licenses are still outstanding.

At about the same time the Post Office established exchanges in London and laid down an expensive underground system of telephones within the city area; this area includes the County of London and surrounding districts, roughly about 640 square miles. Within this large district the National Company and the Post Office are competitors, but, except in the center of London, arrangements have been made to develop certain districts by the company and certain other districts by the Post Office. The rates charged to new subscribers to the two systems operating within the London district have been practically identical, and the two systems are intercommunicative.

As the termination of the National Company's license approached it became necessary for the Government to decide whether it would purchase the company's plant or undertake to set up an entirely new plant of its own to serve its future monopoly of telephone commmunication. All practical reasons pointed to the taking over of the company's plant as the best course, and in 1901 the Post Office reached an agreement with the Company for the purchase of its plant within the City of London at the expiration of its license. In 1905 another agreement was made between the Postmaster General and the company providing for the purchase of the company's entire plant. By the terms of this agreement the Post Office is to buy and the company is to sell, on December 31, 1911, the entire plant of the company which is in use under the sanction of the Postmaster General for the carrying on of the company's licensed telephonic business. Control of the company's plant and of all income from its service is to pass to the Post Office on that date, regardless of whether all details of purchase price have been then agreed upon or decided by arbitration. Provision is made by which the Government is allowed to pay three-fourths of the purchase price at its own option or with the consent of the company the whole purchase price, in annuities extending over a period of twenty years.

The agreement for the purchase of the company's plant contains certain provisions as to the method of reaching the valuation which call for expert advice such as the Jackson firm will be called upon to give. The agreement defines the value of the plant as "the value on December 31, 1911 (exclusive of any allowance of past or future profits of the undertaking or any compensation for compulsory sale or other consideration whatever), of such plant, land, buildings, stores and furniture, having regard to its suitability for the purposes of the Postmaster General's telephonic services." The phrasing of the agreement on this point repeats the language of the decisions to the House of Lords upon the interpretation of the tramway act of 1870. This decision uses the term "then value"; and applied to the present undertaking the decision is to the effect that the price to be paid by the Post Office is the sum which it would cost to replace the plant on the date of purchase diminished by the money expense of the depreciation of plant during its time of use.

Two general problems, therefore, are before the Government in reaching a valuation of the National Company's plant. One of these problems is the present value of the various parts of

the plant computed according to the rule thus stated. The other problem is the extent to which the valuation and the obligation to purchase may be affected by the fitness or unfitness of various parts of the plant to the conduct of telephone business under the "purposes of the Postmaster General." The decision of this point evidently hangs on various large matters of policy. Within the City of London, for instance, the company has many overhead conductors, and it is likely that the Post Office would substitute underground cables in place of these. Such a policy would leave the overhead wire much reduced in value. A large portion of the company's instrument equipment is naturally of the magneto type, which is being rapidly superseded in this country and has been to some extent in England.

An agreement on price is to be reached if possible between the Postmaster General and the company. Failing such agreement, the matter will be arbitrated by the Railway Commission.

National Independent Telephone Convention in Chicago.

The annual convention of the National Independent Telephone Association will be held at the Hotel La Salle, Chicago, on February 8, 9 and 10. President Frank H. Woods and Secretary J. B. Ware anticipate a rousing and unusually successful meeting of Independent men from all parts of the country.

Questions of public policy will probably take up most of the convention's time. President Woods in his convention announcement says:

"On account of the importance of the subjects to be presented at the coming convention, I believe that it will mark an epoch in the history of Independent telephony.

"The demand for regulation of the telephone business by commissions cannot be ignored. Some state and federal laws on the subject have already been enacted. The Legislative Committee will recommend a general utility commission law, containing provisions requiring the commission: 1. To establish and regulate rates. 2. To prevent discrimination and undue preferences. 3. To require physical connection and interchange of business among all telephone companies. 4. To prevent unjust or piratical competition. 5. To require approval of issues of stocks, bonds and other forms of indebtedness.

"The Committee has given these matters the careful consideration their importance deserves and no company should fail to have its representatives present to participate in the discussion of problems, the proper solution of which will be of inestimable value to Independent telephony."

Among the papers to be presented are the following: "Telephone By-Products," by H. H. Robinson, Detroit; "Public Relations of Telephone Companies," by William Dunton Kerr, Chicago; "Private Branch Exchanges," by A. J. Shands, St. Louis; "Modern Methods," by a representative of the Statistical Service Company, Chicago; "Traffic Economies," by W. S. Vivian, Grand Rapids; "Getting Business," by Frederick S. Williams, Chicago. Among others who will address the convention will be L. C. Griffits, Louisville; George K. Gann, Lincoln; and W. T. Melchers, Alma, Mich.

A series of technical conferences will again prove an important feature of the convention. The exhibits by manufacturers will be particularly attractive. Over forty representative manufacturers and supply houses will have exhibits of their latest telephone equipment and supplies.

New York-Denver Long-Distance Line Practically Complete.

The new long-distance telephone line between Omaha, Neb., and Denver, Colo., has been practically completed, thus finishing the continuous circuit between New York and Denver, a distance of 2,500 miles. Early in December a conversation was carried on between these two cities. Refinements in the adjusting of the equipment are now being made and it is believed the line will be ready for regular commercial use in about a month. References to the design of this line have appeared in these columns on several occasions.

Wireless Station in South Brooklyn.

Instructions regarding the disposal of cargo of ships approaching South Brooklyn are soon to be transmitted by wireless. A wireless tower with an experimental station is to be installed on one of the buildings of the Bush Terminal Company and will probably be in operation by April 1.

New Wireless Stations.

The secretary of the treasury has approved to Congress an estimate of the secretary of war asking for an appropriation of $50,000 to continue the work of the extension, construction and equipment of two wireless telegraph stations at the Pribilof Islands and at Unalaska, both of which are deemed necessary and essential to increase the efficiency of the present Alaska military cable and telegraph system.

Wireless Changes at Trinidad.

The wireless telegraph stations at North Post and Fort George on the island of Trinidad will probably be discontinued by the Government, and a new one will be established on the island of Chacachacare at an elevation of 1,000 feet above sea level. The new station will be equipped with such instruments as will give a much wider ocean range than is now possible.

Wireless in Africa.

Two wireless stations are in the course of construction in the French Congo, one being located at Brazaville and the other at Pointe-Noire, where the railroad is to terminate. Both stations were established by the French Radio-Electric Society.

Compulsory Wireless in Italy.

The Italian government has required all ships, whether domestic or foreign, engaged in the transportation of emigrants, to be equipped with the Marconi system of wireless telegraphy. The range is specified as 187 miles and the wave length as 600 yards.

Telephones in Canadian Mines.

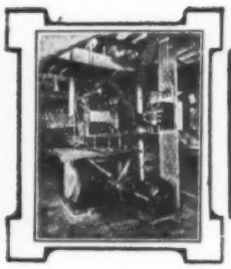
As a result of the mine explosion in the coal mine of the Canadian Collieries Company at Bellevue, Alberta, in which thirty-one lives were lost on December 9, the coroner's jury has recommended that telephones be placed in all the workings of coal mines in Canada.

Platinum in Texas.

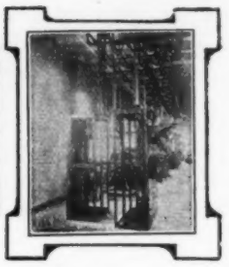
A platinum mine was recently opened between Pecos and San Antonio, Tex., and a shipment of the ore has already been made to Boston.

Wireless Station in Dalny.

The Japanese government is preparing to install a powerful wireless station at the Port of Dalny.



Industrial Power



ALTERNATING-CURRENT MOTOR-OPERATED ELEVATORS.

BY GEORGE J. KIRCHGASSER.

The developments of electrically operated elevator equipments have been along two lines, one suitable to the work of operating passenger elevators and the other suitable for freight elevators.

The speed of operating passenger elevators ranges usually from 75 or 100 feet to 300 and 400 feet per minute. Freight elevators are usually operated at low speeds so that the controlling devices for the motors need not to be so elaborate and expensive. With direct-current systems the adjustable speed motor having a small percentage of compound winding is best adapted

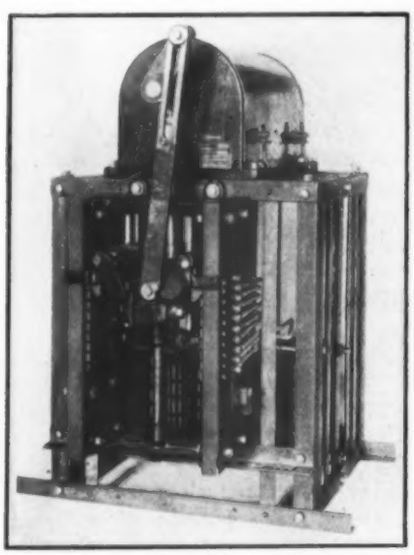


FIG. 1—MECHANICALLY OPERATED, CROSSHEAD-TYPE CONTROLLER.

for obtaining the best speed control and smooth acceleration.

There are many times, however, when alternating current only is available and although many of the first elevators operated by alternating-current motors were not altogether successful yet knowledge was obtained through the experience. Improvements have been made in motors and developments in controlling apparatus so that a very high standard of service is now available. The three principal parts of an electric elevator equipment—the winding machine, motor, and controlling device have been given the special atten-

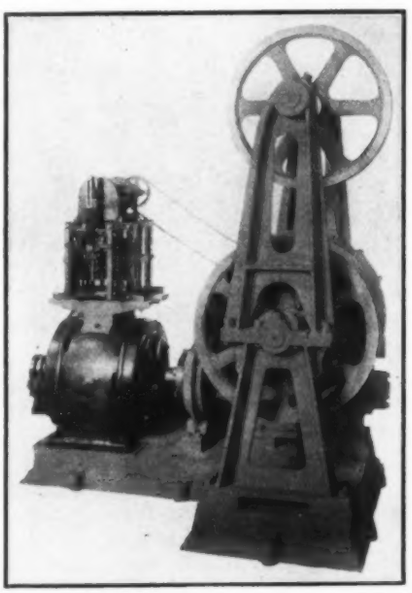


FIG. 2—MECHANICALLY OPERATED CONTROLLER MOUNTED ON MOTOR.

tion required for elevator service and it is now thoroughly realized that each must be chosen carefully.

Squirrel-cage induction motors were used on the first alternating-current elevators, which were of small capacities. The motors were thrown directly across the line and were, of course, only suitable for slow-speed elevators and where line regulation was not important. This type of motor is seldom used now as the starting torque is low, the torque first increasing with increasing speed and then decreasing as the motor arrives at full speed. The starting current is very high and the rate of acceleration is not constant. For slow freight elevators they are sometimes still used especially where the simple construction of the squirrel-cage motor with its absence of commutator and brushes is of advantage. For large capacity elevators the squirrel-cage motor is altogether unsatisactory as it could not be thrown across the line, but a primary resistance would have to be used. This would decrease the already poor starting torque and prove inefficient.

The polyphase slip-ring type of induction motor has proven very satisfactory and the developments of suitable controllers secures smooth acceleration, the slow down, the automatic stop, reversal and many other refinements and without causing violent voltage fluctuations and other disturbances. It is possible to secure a smooth start and maintain constant speed under varying loads. The performance is similar to that of a shunt-wound direct-current motor.

The control of the motor is through

FIG. 3.—FULL-MAGNET REVERSING CONTROLLER AND ELEVATOR EQUIPMENT.

resistance in the secondary circuit which is an efficient, economical and flexible means. But no great advances were made until suitable controllers had been designed and developed which now permit the operation by a car switch and allow the use of automatic devices for slack cable, over-travel, failure of voltage, etc.

There are many types of controllers made covering a variety of cases and including the simple mechanically operated style and the full-magnet style in which the car switch controls only the magnetizing currents for solenoid-operated switches. The Cutler-Hammer elevator controller shown in Fig. 1 is a mechanically operated type adapted for use with two-phase or three-phase slip-ring induction motors for slow-speed passenger and freight elevators. The cutting out of resistance in the secondary and the consequent acceleration

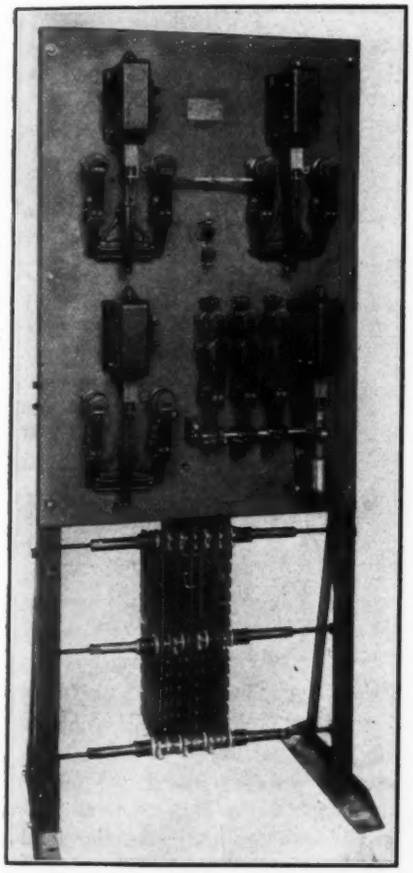


FIG. 4.—SCHUREMAN CONTROLLER.

of the motor is accomplished manually by a crosshead sliding over resistance contact. The speed is governed by a vacuum dash-pot so that the starting is gradual and no excessive current inrushes result.

If instead of a car switch a shipper rope operation is desired a controller illustrated in Fig. 2 will give satisfactory results. This controller has a reversing switch mounted on top for the control of the primary motor circuit and a solenoid-operated self-starter for cutting out the resistance in the secondary motor circuit. The operation is controlled by means of current relays similar to those used in the full-magnet type of controller.

The real developments of interest are in the types called full-magnet controllers which are used for higher speed passenger elevators working at speed of about 150 feet per minute. At high speeds there is a greater inertia of moving parts, and more accuracy and precision are required in stopping. Two types of full-magnet elevator controllers are shown in Figs. 3 and 4. The Cutler-Hammer controller consists of a series of alternating-current switches for the control and reversal of the primary circuit and a number of switches in the secondary circuit for cutting out the resistance placed in this circuit.

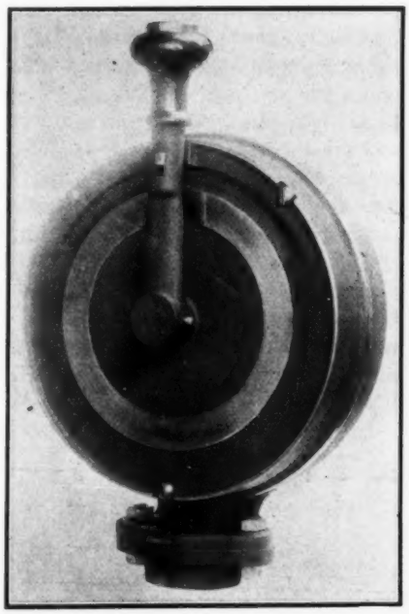


FIG. 5.—CAR SWITCH FOR USE WITH FULL AND SEMI-MAGNET CONTROL.

The switches used on the controllers above described are of the double-pole clapper type and are similar to the mill-type switches for heavy steel-mill service. They have a copper to carbon auxiliary contact, which is designed for breaking the circuit, and copper leaf brush (which carries the current continuously after the switch has first closed) on the auxiliary contacts. This insures good breaking capacity of the switch and high continuous current capacity, with a low temperature rise of the current-carrying parts. Part of the mag-

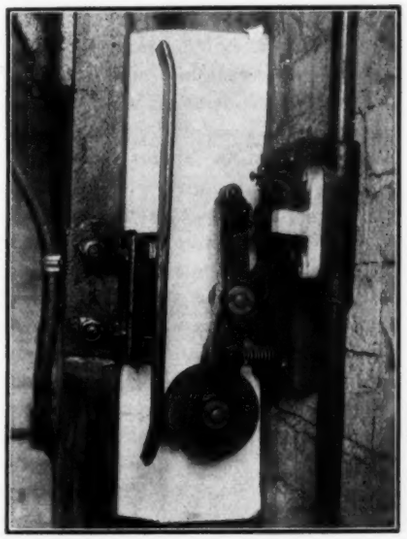


FIG. 6.—VIEW SHOWING LIMIT SWITCH INSTALLED.

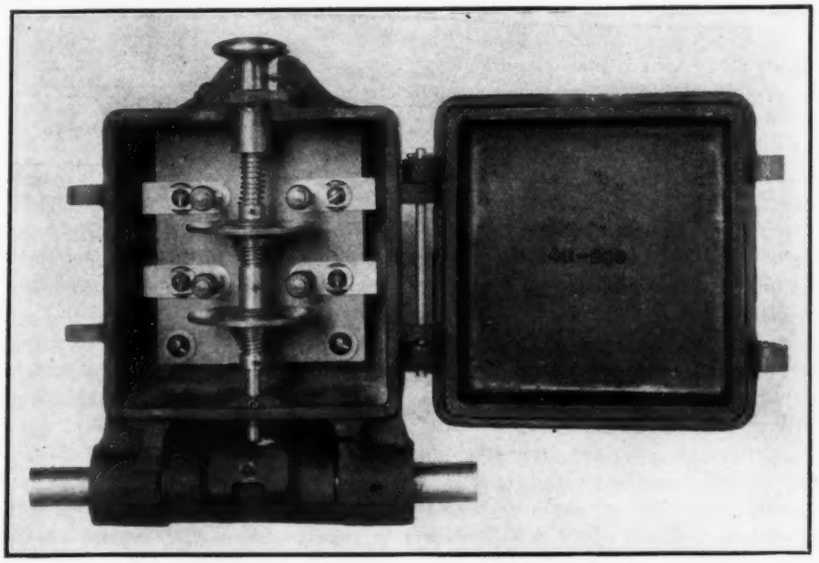


FIG. 7.—SLACK-CABLE SWITCH USED WITH ELECTRIC ELEVATORS.

netic circuit of the switches is laminated so as to reduce the losses due to any currents and hysteresis in the iron. The plunger operates the switch levers by means of a toggle joint, which in the closed position reduce the pull on the plunger and the latter is in addition equipped with a device which will reduce the humming of the solenoid so as to make it practically noiseless. This humming was very objectionable on the first solenoid switches on the market and made the installation of alternating-current elevators in office and apartment houses almost prohibitive. Up-to-date equipments, however, are perfectly quiet and there should be no more complaints from this cause.

The switches above referred to are placed at the top of the board and are controlled by current relays mounted below which respond to the current surges in the motor circuit. By suitable adjustment of these relays the starting current is limited to a predetermined maximum. The advantages of this method of control can well be understood by recalling some of the characteristics of the alternating-current slip-ring motor.

The starting torque of the slip-ring motor up to about 2.5 times normal torque is approximately proportioned to the starting current, but if the current is increased above this amount by cutting out resistance, the starting torque decreases again, the short-circuiting of the rotor causing a large drop in torque. Now if the switches, which cut out the resistance and allow the current to increase, are operated on the time element principle, that cutting out resistance at certain fixed intervals, the motor might become stalled. This might result when an elevator is heavily loaded causing the motor to start slowly and before sufficient speed is attained the resistance would be cut out and the rotor short-circuited, which would give a low starting torque.

With the current relay acceleration resistances are cut out in steps only as the motor reaches certain speeds, at which speeds the cutting out of additional steps of resistance will increase the torque. There are no voltage variations or line disturbances which would seriously affect the starting performance of an alternating-current motor and also interfere with other apparatus on the same line.

With full-magnet type controllers there are many accessories. The car switch, shown in Fig. 5, controls the magnetizing current of the controllers. The operating lever is latched in the central, or off, position and to release it the button mounted on the top must be depressed. The lever is brought to the center position by a spring should the operator remove his hand. This insures safety as, should any accident or illness befall the operator, the elevator would be brought to a standstill.

The hatchway limit switch, Fig. 6, is of simple construction. In the illustration it is so placed that, should the car fail to stop before reaching it, the roller of the switch comes in contact with a cam surface on the car and is forced back a little, raising the opposite end of the pivoted arm, opening the end of the pivoted arm and opening the control

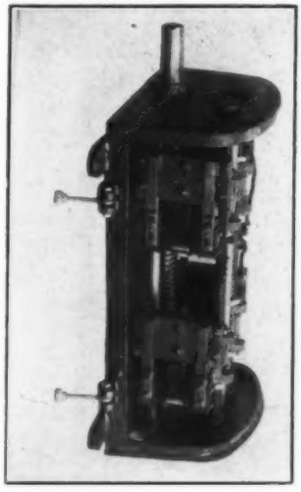


FIG. 8.—LIMIT SWITCH—TRAVELING-CAM TYPE WITH COVER REMOVED.

circuit. In installing, one switch is usually placed at the point where it is desired to slow down and two switches (equivalent to a double-pole switch) at the point where the elevator is to be brought to rest.

The slack-cable switch, Fig. 7, has a shaft at the bottom which is attached to the slack-cable arm of the winding machine. Should the cable become slack this switch stops the elevator by opening the motor leads.

A traveling-cam limit switch, Fig. 8, consists of a shaft (which when installed is geared directly to the shaft of the winding drum) threaded to drive a nut along its length as the car moves from one limit of its run to the other. As the car reaches either limit, double-pole switches are tripped out which slow down the elevator and bring it to rest.

In order to stop the motor used on the elevators operating at the higher speeds, it is necessary to use a solenoid-operated brake. The solenoid brake shown is adapted for polyphase circuits and in it the humming noticed with single-phase solenoids has been reduced to a negligible quantity so that their use is not objectionable in office buildings, apartments, hotels, etc.

The characteristics of the alternating-current motors are so that no dynamic braking can be obtained and the only possibility of stopping the equipment is therefore by means of the mechanical brake. For this reason it is not feasible to use at the present time, alternating-current motors for very high-speed elevators. In general they should not be used for speeds above 150 feet per minute, but where conditions are especially favorable and where the braking mechanism and the elevator mechanism and the elevator machine have been designed properly, speeds of approximately 300 feet per minute have been obtained and the equipments are giving good satisfaction.

The development of the single-phase and polyphase commutator motors during the last few years looks very promising and it is quite likely that we will have in the near future a practical alternating-current motor which permits of dynamic braking and the introduction of such a motor would give a new impetus to the application of alternating-current motors for elevator service.

New Electric Steel Works in Norway.

A recent consular report states that the Stavanger Electro-Staalverk Company is being organized to establish a plant for making high-grade steel electrically, using a process similar to that now used in Dommarfvet, Sweden, and elsewhere.

The new company plans to take over the plant of the Stavanger Skibs-Ophugnings Company, and continue purchasing and breaking up old steel and iron vessels. The company will also secure raw materials from other sources and install modern machinery for making fine quality steel. The new plant is being located at the near-by village of Jorpeland, where electric power has been secured at $6.70 per horsepower per year for the first 1,500 horsepower and $5.35 for 1,000 more horsepower delivered at the power shaft.

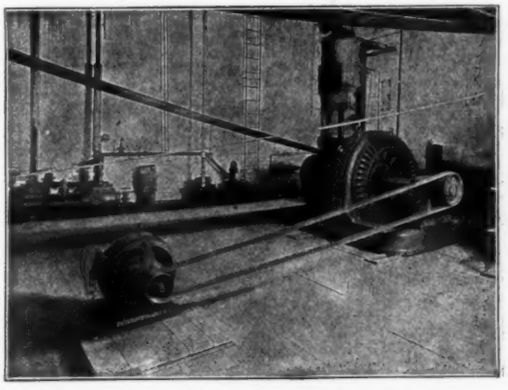
Electric Plant of Kingfalfa Mills, Nebraska City, Neb.

The extensive use of alfalfa meal for stock feeding in our western states has caused a very rapid growth of a new industry; namely, the grinding of alfalfa stalks for the production of this highly nutritious product.

The mills are usually electrically driven and they form an attractive example of the way in which electric power contributes to the development of a new industry.

A typical installation is that of the Kingfalfa Mills at Nebraska City, Neb. Their plant consists of a 300 kilovolt-ampere, 440-volt, 600 revolution-per-minute, three-phase, sixty-cycle, alternating-current generator of the two-bearing, belt-driven type; this is driven by a 300-horsepower simple, non-condensing Corliss engine, and the power developed is used to drive a disintegrator or alfalfa meal mill and other auxiliary machines, such as blower, dust collector, packer, etc. The alfalfa mill is driven by a 150-horsepower slip-ring type motor, which is belted to the mill.

MOTOR DRIVING MEAL MILL.



300-KILOVOLT-AMPERE GENERATOR.

On account of the great weight of the mill and the inertia of the moving parts a high starting torque is required to start and bring it up to speed, which is a severe test on the capacity of both the motor and generating plant.

The main motor drive and the generating plant are shown in the accompanying illustrations.

The plant has a capacity of four tons per hour of the finished product, and in a test of several hours' continuous operation has been worked to the capacity of six or seven tons per hour. The entire electrical equipment was manufactured and installed by Fairbanks, Morse & Co.

Electric Power Operates Concrete Mixers in England.

Concrete has entered largely into the construction of what is known as "England's first skyscraper," the new building now under construction for the Royal Liverpool Insurance Company. This building is 301 feet long, by 177 feet 6 inches wide, with a height of 360 feet from the basement to the top of the dome. Concrete reinforced by steel is used as a base for the walls, over which a veneer of granite is being placed. The estimated quantity of concrete used in the framework of this building is about 17,000 cubic yards, which is prepared by an electrically driven mixing machine, provided with a tank which automatically discharges the correct volume of water for each batch made, the water tank being connected with the city mains.

The whole of the mixing plant is located in the basement of the building in order that the component parts may be delivered in chutes from the street level to the bins below. The work turned out for a day of nine hours with this mixing plant is said to be upward of 100 cubic yards. All the concrete is transported to the floor under construction by steel wagons of the side-tip pattern on hoists, electrically driven from the basement. The concrete used in the construction of this building is made of the following proportions: Three parts broken granite, two parts sand, and one part Portland cement.

Joint Meeting in St. Louis.

At a recent joint meeting of the St. Louis section of the American Institute of Electrical Engineers and the Engineers' Club an illustrated talk on "Motor Drive in the Steel Plant of the American Car & Foundry Company" was given by Joseph A. Osborn, electrical engineer for that concern.

Electric Steam-Boiler.

The application of electric traction to through passenger trains brought with it a difficulty in the way of heating the cars during the time that they were attached to the electric locomotive. Several methods of overcoming the obstacle were tried and finally, as described in the *Engineering News*, an electrically-heated steam boiler was devised.

In this boiler, which is of the vertical tubular type, resistance units have been slipped into the tubes, so that they are at all times protected from moisture. Each heating unit consists of a core of steatite on which is wound patent alloy resistance wire which will withstand high heats without disintegration or oxidation. The element is first slipped into a thin brass tube, the resistance wire being held from contact with the sides by porcelain insulators. The space between this heating element and the sides of the brass tube is filled in with a fine silicious sand, which serves to conduct the heat from the resistance wire and also as an electrical insulator.

Cotton Mill Electrifies.

The Smitherman Cotton Mills are now operating by electric power, this being obtained from the development of the Smitherman Power Company at the Little Whitney Falls on Little River, six miles south of Troy, N. C. This mill company is closely allied with the power company. It has a plant of 5,824 ring spindles and 216 broad looms for manufacturing yarns and domets.

FINANCIAL REPORTS OF ELECTRICAL COMPANIES.

AMERICAN LIGHT & TRACTION.

The report of the American Light & Traction Company for the month of December and twelve months ended December 31 compares as follows:

	1910	1909
December gross	$ 427,089	$ 391,822
Expenses	9,958	9,562
December net	417,131	382,259
Twelve months' gross	3,832,552	3,345,441
Expenses	119,688	106,261
Twelve months' net	3,712,868	3,239,179

ELECTRICAL SECURITIES CORPORATION.

The Electrical Securities Corporation has issued its annual report for the year ended December 31, 1910. The income account compares with year ended October 31:

	1910	1909
Total receipts	$ 390,084	$ 368,501
Interest, expenses, etc	196,854	217,600
Net profits	*193,230	150,901
Previous surplus	904,294	561,212
Profits from sale securities	28,540	826,738
Income value of assets	83,980	.....
Total surplus	1,210,044	1,538,851
Dec. value of assets	.....	451,009
Preferred dividends	50,000	50,000
Common dividends	160,000	120,000
Total deductions	210,000	621,009
Profit and loss surplus	1,000,044	917,842

*After allowing five per cent dividends on $1,000 000 preferred; the balance $143,230 is equal to 7.16 per cent on $2,000,000 common.

AMERICAN TELEPHONE & TELEGRAPH.

The American Telephone & Telegraph Company and associated holding and operating companies in the United States, not including connected independent or sub-license companies, report for the eleven months ended November 30, 1910, compares as follows:

	1910	1909
Gross earnings	$150,244,013	$135,151,170
Operating expenses	49,148,357	44,568,251
Current maintenance	23,479,584	21,727,355
Depreciation	24,159,198	18,972,564
Taxes	7,460,640	5,961,014
Total expenses	104,247,779	91,229,184
Net earnings	45,996,234	43,921,986
Interest	10,513,012	9,670,296
Surplus	35,483,922	34,251,690
Dividends (11 months)	23,093,938	22,071,816
Surplus	12,389,284	12,179,874

The unexpended portion of provision made for depreciation for the first eleven months of 1910 was $16,802,205, which is not counted as profits but remains as a reserve for future replacements.

KANSAS CITY RAILWAY & LIGHT.

The report of the Kansas City Railway & Light Company, for the month of December and seven months ended December 31, 1910, compares as follows:

	1910	1909
December gross	$ 684,385	$ 622,049
Expenses and taxes	417,682	377,571
December net	266,703	244,478
Charges and taxes	191,069	172,062
December surplus	75,633	72,416
Seven months' gross	4,513,590	4,173,697
Expenses	2,701,178	2,396,205
Seven months' net	1,812,412	1,777,492
Charges	1,323,245	1,209,122
Seven months' surplus	489,167	568,370

MEXICAN TELEPHONE & TELEGRAPH.

The report of the Mexican Telephone & Telegraph Company for the month of November and nine months ended November 30, 1910, compares as follows:

(Mexican currency)	1910	1909
November gross	$ 49,254	$ 41,890
Expenses	24,500	19,983
November net	24,743	21,907
Nine months gross	423,763	350,474
Expenses	197,520	170,667
Nine months net	226,243	179,806
Construction	206,090	172,716

HUDSON & MANHATTAN RAILROAD.

The Hudson & Manhattan Railroad Company reports for the month of December and six months ended December 31, 1910, as follows:

	December	July 1-Dec. 31
Gross revenue, all sources	$ 387,659	$2,036,368
Operat'g expenses and taxes	182,691	925,151
Gross income appl. to fixed charges	204,967	1,111,216
Interest on total interest-bearing bonds outstanding	243,958	1,463,748
Less interest chargeable to construction	73,020	438,121
Balance	170,938	1,025,629
Other charges	22,361	125,830
*Total deductions from income	193,299	1,151,459
Surplus	11,667	†40,243

*Being fixed charges applicable against that portion of the property employed in present operations.
†Deficit.

NORTHERN OHIO TRACTION & LIGHT.

The Northern Ohio Traction & Light Company has issued its full pamphlet report for the year ended December 31, 1910. The income account compares as follows:

	1910	1909
Gross	$2,437,426	$2,177,642
Expenses and taxes	1,348,963	1,190,057
Net	1,088,463	987,585
Charges	521,069	524,066
Surplus	*567,393	463,519
Dividends	225,000	157,500
Surplus	342,393	306,019
Previous surplus	947,166	782,942
Total surplus	1,289,559	1,088,961
Depreciation and charges	214,748	141,794
P. & L. surplus	1,074,812	947,166

*Equal to 5.67 per cent on $10,000,000 capital stock before charging out depreciation, as compared with 4.63 per cent earned on same stock previous year.

COLUMBUS RAILWAY & LIGHT.

The Columbus (O.) Railway & Light Company reports for the year ended December 31, 1910, compare as follows:

	1910	1909	1908
Gross	$2,378,720	$2,577,202	$2,281,951
Expenses	1,618,223	1,290,133	1,185,604
Net	760,497	1,287,069	1,096,347
Other income	17,308	17,865	18,795
Total income	777,805	1,304,934	1,115,142
Fixed charges	1,011,975	971,707	920,253
Deficit	234,170	*333,227	*194,889

*Surplus.

VIRGINIA RAILWAY & POWER COMPANY.

The report of the Virginia Railway & Power Company for the month of December and six months ended December 31, compares as follows:

	1910	1909
December gross	$ 197,794	$ 175,246
Expenses	95,122	88,906
December net	102,672	86,340
Six months gross	1,131,892	1,020,520
Expenses	560,588	535,697
Six months net	571,304	484,823

AMONG THE CONTRACTORS AND SUPPLY MEN

ERNER & HOPKINS COMPANY has been awarded the contract for wiring the power house at the penitentiary at Columbus, O.

THE DIXIE ELECTRIC COMPANY has been incorporated with a capital of $12,500 by Clarence Jones, Hopson Owen, W. H. Crump and Peter W. Crump. The company will handle electrical supplies.

SNARE & TRIEST, New York, N. Y., have received the contract for the construction of a power plant at the naval coaling station, Tiburon, Cal., the contract price named being $23,900.

THE INTER-STATE ELECTRIC COMPANY, Chicago, Ill., which was incorporated a short time ago, will do a general electrical and contracting business. The incorporators are C. B. Huff, George E. Hornecker and Mrs. B. Huff.

THE R. HAAS ELECTRIC & MANUFACTURING COMPANY, of Springfield, Ill., received the contract for the electrical work in the new twenty-two story office buidling being erected by C. C. Heisen at Harrison and Dearborn Streets, Chicago.

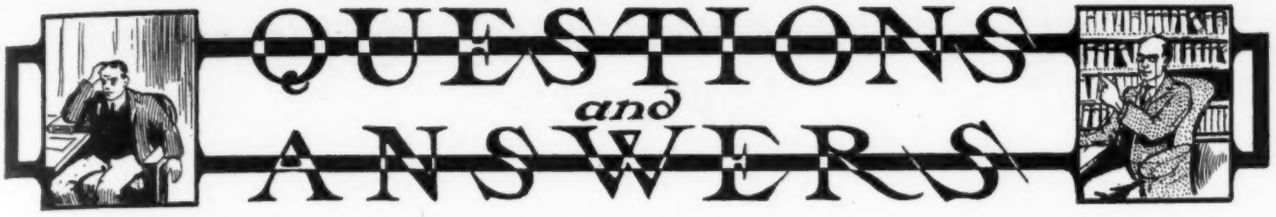
THE NATIONAL ELECTRIC SIGNALING COMPANY, Pittsburg, Pa., has been awarded a contract for furnishing one two-kilowatt constant-speed motor-generator set, and one two-kilovolt-ampere open-core wireless-telegraph transformer for the Mare Island Navy Yard, at San Francisco. The price bid was $1,065.

Proposed Tariff Reductions.

By the terms of the proposed tariff agreement with Canada, there will be no duties imposed upon telegraph and telephone poles, nor carbon electrodes, and the duties will be reduced upon mica to five cents per pound plus 17.5 per cent, upon electric vehicles to 30 per cent.

The duty upon aluminum bars imported from Canada to this country will be reduced to eight cents per pound and upon iron ore to ten cents per ton.

The agreement must be passed upon by the Canadian Parliament and the United States Congress before going into effect.



LIGHTS AND POWER FROM THE SAME TRANSFORMER.—Is it necessary to have separate transformers for lights and power on a three-phase, four-wire system?—G. A. T., Lander, Wyo.

The larger light and power companies usually provide separate banks of transformers for the light and power circuits. For incandescent lighting close regulation of voltage is necessary. The intermittent throwing on and off of large motors causes serious fluctuations of voltage, which result in flickering of any lights on the same circuit. Therefore, if the load on a bank of transformers is largely a motor load, or if the motors, even though not numerous, are frequently started and stopped, it is very desirable to have separate banks of transformers and separate circuits for the lights and motors. This is true even on a four-wire, three-phase distributing system, although the latter is frequently loaded to a moderate extent with small motors across the outer leads and with lights between the outer leads and the neutral, which is usually grounded. In such a system the voltage between the leads and neutral is fifty-eight per cent of the line voltage. Thus, if 115-volt lamps are used, 200-volt, three-phase motors must be employed.

MOONLIGHT SCHEDULE.—Why does the number of hours on the moonlight schedule vary from year to year?—R. S., Ellsworth, Kans.

The principal reason for the variation of the total number of hours of burning on the moonlight system is that during certain years there are twelve full moons and during others thirteen full moons. As there are three successive nights around full moon during which no lamps are lighted, an extra full moon cuts down the number of hours of burning materially.

PHANTOM CIRCUITS.—There have been some articles in your paper recently that referred to phantom circuits in telephone work, but did not explain what was meant by that term. Kindly give a simple explanation of this.—B. McD., Streator, Ill.

Where two metallic telephone circuits run side by side it is possible to make use of each of these circuits as one side of a third circuit, which is called a phantom circuit because it is practically made out of nothing in so far as additional line wire is concerned. The original or side circuits are also called the physical circuits to distinguish them from the phantom. The latter circuit is connected through repeating coils to each end of the physical circuits. By using both wires of the side circuit to form one side of the phantom the inductive disturbances due to signaling and conversation in the side circuit are practically neutralized, and the phantom has really twice the conductivity that the side circuits possess. Phantom circuits are used principally on long-distance telephone lines. They are also used to a limited extent in some systems of telegraphy. See also the ELECTRICAL REVIEW AND WESTERN ELECTRICIAN of October 1, 1910, page 690.

TRIMMING ARC LAMPS.—How many street arc lamps can one trimmer take care of in an eight-hour day?—S. A. V., Hamilton, Ohio.

This depends on the type of lamp, distance between lamps and whether the man walks or rides on his rounds. For a spacing of about 300 feet between lamps a walking trimmer can attend to about eighty-five plain open arcs, eighty magnetite lamps, fifty to seventy flaming arcs, and fifty double-globe inclosed arcs; it is assumed that he keeps the globes reasonably clean. If a special tower wagon is used to save both walking and climbing of lamps, these figures can be increased fifty or more per cent.

THREE-PHASE RAILWAYS.—Is it possible to use three-phase power for electric railways? Have any three-phase railways ever been built?—J. E. N., Galveston, Tex.

It is not only possible to use three-phase currents directly for electric traction, but it has been done in numerous successful instances, notably on several Italian and Swiss mountain railways and in the Cascade Tunnel in Washington. Two adjacent trolley wires are used and these with the rails form the three wires of the supply circuit. Besides this direct use of three-phase power, there is a very general use of three-phase transmission from the generating station to substations, where the supply is transformed to a lower voltage and converted into direct current for use on the ordinary trolley systems.

BOARD OF TRADE UNIT.—What is meant by a Board of Trade unit that one reads of occasionally in English papers?—H. M. Q., Buffalo, N. Y.

The kilowatt-hour is commonly referred to as the Board of Trade unit of electrical energy in Great Britain. The Board of Trade is a British governmental body.

COST OF ELECTROLYTIC REFINING OF COPPER.—What is the average cost of refining copper by the electrolytic process?—E. P., Bay City, Mich.

This cost varies from one-quarter to three-quarters of a cent per pound of copper refined, depending on the cost of electric power and size of plant.

Marion Municipal Plant Discontinued.

A contract which seems highly advantageous to the citizens of Marion, Ind., has been made recently between the Marion Light & Heating Company and the city of Marion.

Under the provisions of the contract, which is for a period of ten years from January 20, 1911, the company furnishes current to the city, for its street lighting, at 1.5 cents per kilowatt hour. The company also reduces its domestic rate from ten cents to eight cents per kilowatt-hour and the monthly minimum from $1.00 to twenty-five cents.

The municipal plant, which has been running on a moonlight schedule, will be closed down entirely and it is estimated that the city, under the new contract, can furnish all-night lighting at a figure much more economical than it formerly did on the moonlight system.

New Electrical and Mechanical Apparatus and Appliances.

A New Type of Graphic Recording Meter.

It is now generally conceded that in order to secure the highest operating economy from electric power or lighting systems it is essential that an exact knowledge be secured of the load conditions existing at all hours. Central-station economy is largely dependent upon the character of the load curve which, if known, can frequently be greatly improved by redistribution of circuits or by taking on loads at certain predetermined periods of operation.

As the necessity for obtaining accurate records becomes more apparent to central-station managers the advantages of the graphic-meter method over the other methods becomes more apparent, in that the personal equation is not only eliminated, but the expense of securing records is materially reduced.

One of the greatest objections to the use of the graphic meters has been that the construction usually adopted has been more or less delicate and the elements are quite easily thrown out of adjustment. These inherent faults render it necessary that the greatest of care be exercised when installing meters to insure that they will be in operative condition and constant care must be given them after installation to avoid the introduction of registration errors.

With a full appreciation of conditions to be met, R. G. Lanphier, of the Sangano Electric Company, Springfield, Ill., and H. W. Young, of Chicago, have developed a type of graphic recording meter which is a radical departure from the forms heretofore employed. Several different forms are manufactured as follows: Shunt type, two and three-wire direct-current ammeters and wattmeters; series of transformer type, two or three-wire single-phase wattmeters; series of transformer type two-phase or three-phase wattmeters for use on three or four-wire two-phase, or three-phase circuits.

In each type the record is made on a paper chart ruled with rectangular co-ordinates and driven by clockwork mechanism. The movement of the recording pen across the chart is proportional to the quantity measured and the speed of the record chart is controlled by a driving clock.

The switchboard, or permanent mounting form is shown in Fig. 1. The measuring elements consist of two mercury floated motor elements so located as to actuate a common indicator to which is attached a recording pen which traces the line or curve on the moving chart. The principle employed is the same as in all forms, the only difference being in the type of winding or magnets employed. This construction insures a uniformity and interchangeability of product which is

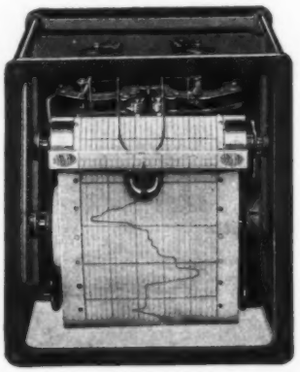


FIG. 1.—NEW GRAPHIC RECORDING METER.

highly desirable. The retaining case is of metal with open glass front and sides, thus harmonizing with the other switchboard fittings. In addition to the recording feature each meter is provided with an indicating scale, thus rendering unnecessary the use of indicating ammeters or wattmeters. The various parts are finished in dull black or marine, bringing into strong contrast the indicating scale and record chart.

The portable type illustrated in Fig. 2 employs the same elements as the switchboard form with exception of the case and arrangement of binding posts or terminals. It is not of the so-called semi-portable type, but is intended for use in the same sense as any of the well known forms of portable testing meters. This desirable feature is rendered possible by the principle of operation and construction, a detailed description of which is given below.

Each meter is provided with two measuring elements which may be separately energized as in polyphase wattmeters, three-wire direct-current and alternating single-phase, or may be connected in series or parallel for use on two-wire direct-current or single-phase alternating-current.

The moving element consists of a simple metal disk or sector rigidly attached to a shaft carrying the recording pen mounting and control springs. The moving disk is floated in a mercury chamber which not only serves as a conducting medium for the current to be measured, but also by the damping action of the disk passing through the mercury renders the meter indications highly aperodic or dead beat. This is a very important and desirable feature when meters are measuring fluctuating loads, as it insures a true record free from false indications or "overshooting."

Surrounding the moving disk is a magnetic field generated by electromagnets in the alternating-current meters and direct-current wattmeters, the latter being operated from shunts. Permanent magnets are employed in the direct-current ammeters. The magnetic field of the fixed elements is in such relative position to the moving system or armature that it cuts or passes through the arature field and tends to rotate the moving system. This rotative movement causes the recording pen to move across the chart against the restraining force of the control springs, which tend to return the pen to the zero position. The turning force of the mercury-floated moving element is thus balanced against the restraining or coercive force of the control springs and their point of balance or equilibrium is a measure of the current flowing in the measuring coils.

With this construction, therefore, is secured the three essential elements, a turning and restraining force and a means of indicating or recording the current or energy value.

The recording pen is so constructed and formed as to provide an ink reser-

voir of sufficient capacity for several days use. The pen point is composed of special metal alloy, insuring a clear cut line without blurs or blots.

The clock is a standard accurate timepiece, the function of which is to drive the record paper under the recording pen at a uniform predetermined rate, synchronous with the time markings on the record paper. The eight-day hand-wound type has been adopted as standard and the driving springs are of such size and strength that the clock mechanism is under a strong uniform force, giving a powerful torque and insuring a positive feed to the record paper.

The record paper is graduated longitudinally in a set of parallel lines representing the meter calibration, the spacing being uniform with the various capacities, but of different values. At right angles to the calibration lines are parallel lines representing hours, varying in distance from each other with the particular rate of speed for which the record paper is marked. The rectangular co-ordinates permit of a record easily interpolated and in watt-meters the record can readily be totalized by means of a planimeter.

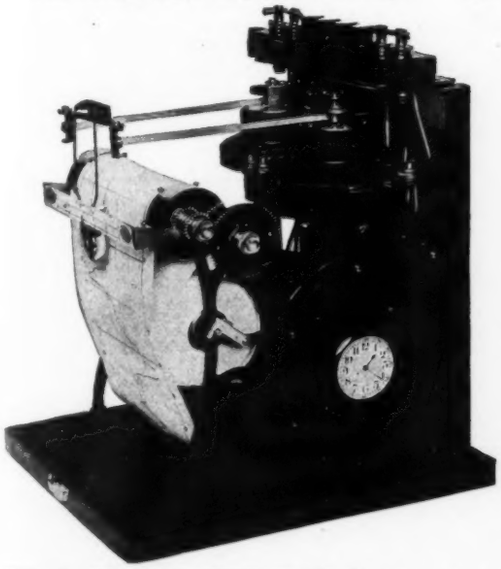
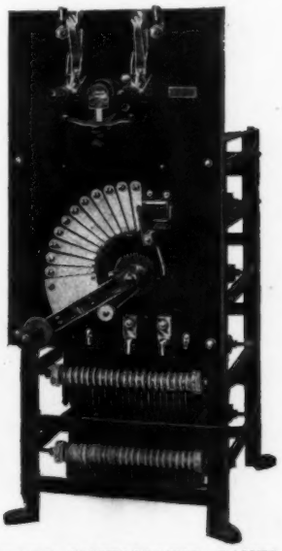


FIG. 2.—GRAPHIC METER WITH COVER REMOVED—PORTABLE TYPE.

The driving force of the clock is transmitted to the paper roll through a suitable gear and pinion. Three inches per hour has been adopted as the standard rate of feed, but other speeds may easily be obtained by substituting gears and pinions having different ratios of teeth. These changes may be readily made, thus enabling the meter to be employed for special tests.

The use of mercury suspension in a non-spillable chamber is a decided improvement in design and has the advantage of enabling meters to be shipped and installed without the necessity of making complicated or difficult adjustments as it is simply necessary to fill the pen and start the driving clock. The absence of bearing or jewel trouble, combined with simplicity of installation, is of the greatest importance to users, in that the ordinary station operator can install and care for the meters without the assistance of an expert.

The construction adopted is also unique, in that it secures a "torque" or turning moment much higher than has been heretofore attained. This high torque in conjunction with the miniumu friction value of the mercury floated moving element gives a ratio of "torque to weight and friction" of such value that errors due to pen friction on the chart are entirely eliminated.

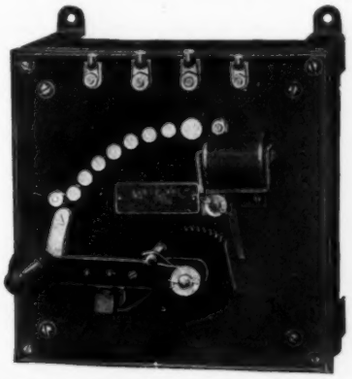


CR-143 SPEED-CONTROLLING PANEL—FLOOR TYPE.

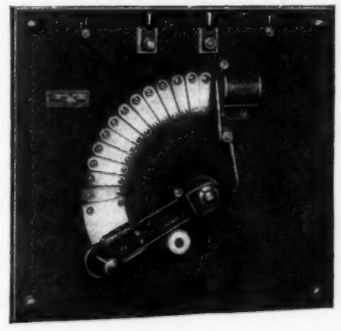
An important feature in this new design is that the moving element of the measuring system is inherently damped or rendered highly aperiodic by the dash pot action of the copper vane traveling through the mercury chamber. The area of the moving system is so proportioned to the mercury chamber area that the recording pen will not overshoot or under-register, insuring an accurate record on the most rapid load fluctuations.

Speed-Controlling Devices for Constant Torque.

For the control of series, shunt or compound-wound direct-current motors driving machinery in machine shops and printing establishments where the nature of the work is such that in general a constant torque must be developed by the motor, that is, the motor requires the same current at half speed as at full speed, a controlling device must be of exceptionally rugged construction. The General Electric CR-151 speed-controlling rheostats are designed for this service and embody features which add greatly to the convenience and reliability of their operation.



CR-152 SPEED REGULATING RHEOSTAT.



CR-151 SPEED REGULATOR.

The contact segments are of liberal size and so designed that they may be very easily and quickly removed.

For protection from failure of voltage and the consequent danger of power being again thrown on the line without resistance in series with the motor armature, they are provided with a no-voltage-release attachment. Upon failure of the voltage, the retaining magnet is demagnetized, releasing the switch arm and a spring instantly returns it to the off position, making it

absolutely impossible to close the armature circuit without cutting in all the armature controlling resistance. The no-voltage-release coil is connected directly across the line in series with a resistance and is thus independent of the current of the motor field, and will protect any motor with which the rheostats may be used.

The resistance units are of an improved design, so constructed as to be non-fragile, and thoroughly ventilated.

Where additional protection is desired, the CR-155 rheostats, which have all the features of the CR-151 and in addition are provided with an overload-release coil, may be used.

For installations where the service is not so severe, CR-152 rheostats are provided, similar to the CR-151 with the exception that they do not have renewable segments. In the larger sizes, the circuit is made and broken

CR-143 SPEED-CONTROLLING PANEL—WALL TYPE.

on an auxiliary button which is so designed that it can be easily renewed.

CR-156 controllers are similar to the CR-152 with the addition of an overload-release coil. The controllers are mounted on a slate base in connection with a double-pole circuit-breaker, presenting a very compact and attractive appearance and affording ease of installation.

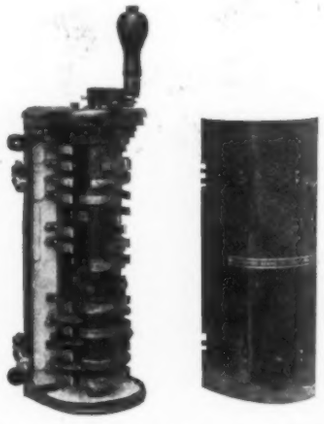
Lecture on Ironclad-Exide Battery.

An illustrated lecture dealing with the new Ironclad-Exide battery, manufactured by the Electric Storage Battery Company, Philadelphia, Pa., was given on Tuesday, January 31, in the rooms of the Western Society of Engineers. The lecture dealt with the development and construction of the ironclad battery and its adaptability for electric vehicle service. Louis A. Ferguson, vice-president of the Commonwealth Edison Company, Chicago, presided, and a general discussion ensued.

Drum-Type Alternating-Current Reversible Controllers.

The direct-current motor has long been in use in the printing plant and has furnished a most satisfactory power. However, the wide distribution of alternating current has caused the substitution of alternating-current motors for many purposes, including the operation of printing presses.

For printing presses, machine tools and similar machines it is desirable to control the speed and reversal of the motor in a convenient manner. The Cutler-Hammer Manufacturing Company has developed an alternating-current drum-type reversible controller for use with polyphase slip-ring motors driving printing presses, machine tools, etc. The standard controllers are made in capacities from one horsepower to 7.5 horsepower and can be easily mounted on the press or machine within easy reach of the operator.



ALTERNATING-CURRENT CONTROLLER.

The speed reduction is secured through resistance in the three phases of the secondary maintaining an electrical balance and permitting of the best operating conditions. A reduction of sixty per cent at full load is obtained with the standard apparatus. Full reverse of the direction of the motor is possible, a center latching device operated by a push button on the handle, preventing injury through unintentional throwing of the handle past the "off" point. The dimensions are as small as the satisfactory design allows. The brushes and contacts are made of hard drawn copper and mounted in a manner making replacing easy. All terminals and other parts are readily accessible.

The New Style Electric Washer.

A radical departure in the design of motor-driven washing machines is noticeable in the new Dietz electric washer now being placed on the market.

In contrast to the method of design that has been employed for some time by electric washing machine manufacturers, it is built on the old double rub-board principle, so favorably known in the hand operated form to the American housekeeper.

The faith of the Company in the double rub-board principle is backed by long experience in the manufacture of hand-operated washing machines which have been sold to the extent of more than half a million within the last fifteen years.

NEW ELECTRIC WASHER.

The electrical application to the washer manufactured by the John Dietz Manufacturing Company, Cincinnati, Ohio, shows the work of the skilled designer, and is a piece of mechanism that the central-station engineer will not hesitate to indorse. This is said to be the only electric machine which employs the double rub-board principle of washing. Two semi-circular rub boards of cypress are moved back and forth always in opposite directions about ninety times a minute. The clothes are held in the lower rub board and washed by the upper board. This board is self-adjusting in position to accommodate different amounts of material, so that the machine will wash without injury either a small or large

amount. The normal capacity is from 15 to 18 shirts or the equivalent, washed clean in an average time of five or six minutes.

The clothes are held in the wooden rub-board and do not come in contact with the metal tub which holds the water. All metal parts of the washing machine proper are heavily galvanized to prevent rusting.

Power is supplied from a one-fifth-horsepower Westinghouse motor through a rawhide pinion to a gear which drives a bicycle sprocket and chain to a crank shaft on the washer. This chain is the best hand-made bicycle chain procurable and runs accurately without noise. In fact, the machine is very quiet in operation. A clutch provides ready means of starting and stopping the washer.

The wringer is mounted on the end of the machine and may be operated with the machine open when the clothes are wrung out from the tub into the rinsing water, or with the machine closed when the goods are run back from the rinsing water on to the top of the tub. This is made possible by a reversing drive in the wringer, the clutch of which may be operated so quickly that it is possible to back material out before damage results in case it starts incorrectly.

The machine is constructed in a thoroughly workmanlike manner throughout and will last for years. It washes heavy or light fabrics without injuring them in the least.

Lansden Electric Wagons for Express Service.

Some of the railroads, notably the Pennsylvania, have for some time been experimenting with, and using storage-battery trucks for handling packages, freight, mail, etc., but there has been little active attempt to design anything strictly practical for this class of work, or to introduce the same until quite recently.

The Hamburg-American Line, among others, has been experimenting for the last year or two with several different styles of Lansden industrial trucks, and recently has adopted as its standard a three-wheeled machine, with a speed of four miles an hour, and capable of carrying 5,000 pounds. A view of this wagon is shown in the accompanying illustration.

The driving wheels are provided with the usual type of solid rubber tire; the steering wheel is spring mounted, and for dock work is used without the rubber tire. By using the Edison battery, these little machines are practically fool-proof, and can do the work of a steamship company or large warehouse with a saving of labor, which is startling.

Inspector Koetter of the Hamburg-American Line states that its four present trucks have averaged a displacement of five men each, or that one man with a truck will actually handle more freight than could have been handled by six men with the ordinary type of hand truck, and as there is no appreciable wear on the machine, and the cost of operation exceedingly low, they represent a very profitable investment, and a type of truck which is daily growing more general in its use.

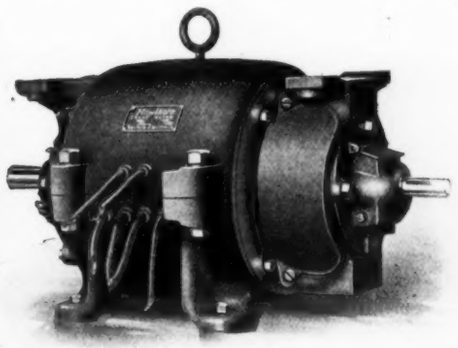
The Lansden Company of Newark, N. J., has standardized these in three different styles of varying load capacities, and invariably design the carrying platform to suit the customers' needs.

LANSDEN ELECTRIC TRUCK.

A New Crane Motor.

A new direct-current, reversible and totally inclosed crane motor, known as the Western Electric Hawthorn type HLA, has just been placed on the market. This motor combines high electrical efficiency with a compact and rigid construction, which insures absolute reliability under the severe conditions common to crane and hoisting service.

These motors are of the totally-inclosed, split-frame type, and are built in sizes ranging from one and three-quarter horsepower at 1,375 revolutions per minute to fifty horsepower at 525 revolutions per minute. The frame is cylindrical in form and of small diameter, requiring minimum head room and reducing the moment of inertia of the revolving parts. The frame is cast of soft steel and designed with a low center of gravity and ample feet surface for rigidly bolting in place. The upper half of the frame may be lifted after removing six or eight bolts, depending upon the size of the motor. This leaves the armature and bearings intact. The heads are not split, but can be lifted out after removing the upper half of the frame and the bolts which secure the heads to the lower frame.



HAWTHORN CRANE MOTOR.

The motor heads, which are held in

place by four bolts, are provided with brackets for the mounting of the back gear shafts and brake pads for the addition of magnetic brakes. These motor heads are adustable, which permits of the motor being mounted in various horizontal positions.

The laminated pole faces, which are cast with the frame, are securely bolted to the poles. This eliminates losses and insures cool operation. The bearings are of the self-oiling, revolving-ring type and their surface is provided with bronze linings. This arrangement insures the efficient lubrication and good wearing qualities necessary for heavy duty. The armature core and commutator are mounted on a quill to facilitate easy removal from the shaft.

A New Central-Office Motor-Driven Lock-Out Selector.

The Anderson Electric & Manufacturing Company, Chicago, Ill., after efforts extending over a period of several years, announces a solution of the problem of placing the party line lock-out system within the range of the large central-energy systems and, therefore, at the disposal of practically all of the different kinds of telephone systems in use today.

This has been accomplished by the perfection of a motor-driven central-office selector which is the acme of automatic selecting devices because of its rapid, positive, economic and accurate operation. The mechanism of the selector consists of three things: motor, relays and the selector proper, which are shown in the accompanying illustration.

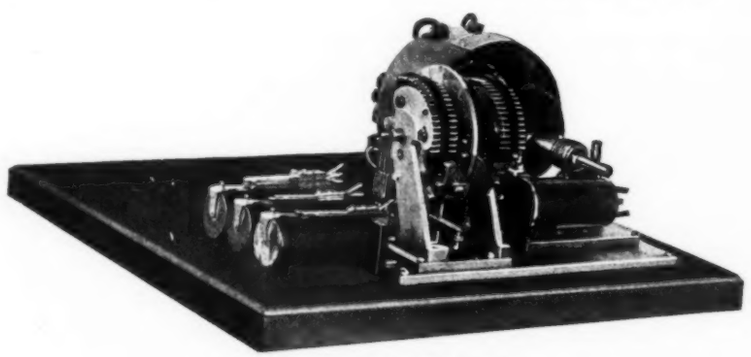
In conjunction with the selector there is used a new type of magnetic key. It is perhaps the neatest and most compact magnetic key that has yet appeared. When in position on the keyboard it reminds one of a bank of order-wire keys, occupying a slightly larger space than the same number of order-wire keys. It should be mentioned, too, that the "touch" of the plungers on the key is more agreeable and more adaptable to satisfactory results than any key heretofore placed on the market.

It also carries a desirable new feature in the way of a magnetic coil that may be readily removed without disturbing the wiring of the key. It has a capacity of twenty stations for any party line, and, in general, one is required for each operator's position equipped with lock-out lines, but it would be possible to arrange for the use of one between each two operators. This new magnetic key takes a prominent part in the working of this new departure in dispensing lock-out service.

In order to make a call, the operator plugs into the ringing or calling jack in the usual way, presses the button or buttons corresponding to the party or parties desired on the lock-out line and pulls the ringing lever associated with the particular pair of cords that are being used. The pressing of the button on the magnetic key cuts off the regular ringing current and completes the circuit for each particular party through the proper contacts on the machine selector. The pulling of the ringing-key lever instantly operates the starting relay on the selector. The operation of this relay causes the motor to start and completes the circuit through an electromagnet which operates a friction clutch on the selector.

This friction clutch remains in contact only long enough to bring the selector to the proper contact. When the selector reaches the particular contact that controls the substation-calling attachment of the subscriber desired, it has fulfilled its function and is instantly cut off and returned to the normal position. This is accomplished by means of a releasing relay, the operation of which is positively predetermined when the proper magnetic key for the party desired is pressed at the start of the call. As soon as the releasing relay operates, the motor which operates the selector stops instantly. It may be operated continuously, if desired, in exchanges where it would be economical to run the motor continuously. Or, it may be operated momentarily during the idle hours and continuously during the busy hours.

The operator holds the ringing-key lever until the supervisory light, directly below the calling jack, appears. This light, which may be covered with a red lamp cap to correspond with the red signals on the substation attachments, remains lighted while the particular line is in use. The red light appears before the operator simultaneously with the red signals at the locked-out stations. As soon as the operator restores the line this red light goes out and all parties on that line are once more at liberty to make calls. In restoring the line to normal condition the operator simply presses the releasing button on the magnetic key and then gives the ringing-key lever a slight pull.



NO. 41 AUTOMATIC SELECTOR.

Another new and important feature is the operator's complete supervision over the lock-out line, since the red lamp stays lighted while the line is in use and remains lighted until the operator restores the line. Heretofore, it has always been necessary for the central operator to "listen in" in order to ascertain when a conversation had been concluded. This new feature, then, really places the lock-out line on a par with the private line insofar as the operator and her work are concerned.

The capacity of a strip of central-office drops or other kind of signal can be increased twenty times. For example, a strip of 15 drops is used ordinarily to take care of 15 individual lines, while by the use of the new lock-out system the capacity of the strip may be increased to 300 lock-out stations and likewise the capacity of a 150-line switchboard for 150 private lines may be increased to 3,000 lock-out stations, if the maximum capacity of the Anderson lock-out system be utilized.

Chicago Automobile Show.

The tenth annual Automobile Show of Chicago, conducted under the auspices of the National Association of Automobile Manufacturers, was opened to the public on Saturday, January 28, in the Coliseum, Coliseum Annex and First Regiment Armory, with the usual large attendance on hand.

In point of decorations the scheme this year is entirely different than at any previous show, the main theme being a French scene of the time of Louis XV. The entire roof of the Coliseum, 300 by 175 feet, is hidden by a painted canvas on which the stained glass effect is secured, the false roof being supported on massive bronze scrolls. Four fountains stand at the center of the four sections, into which the main floor is divided, and are thirty feet wide at the base and thirty-eight feet high. The central column is illuminated by a huge lantern at the top, while water in a four-foot column falls from a height of twenty-eight feet into the basin below.

From either side of the fountains large ornamental shell-shaped vases are arranged in rows on pedestals ten feet in height. Between them are lamp posts bearing clusters of twelve and sixteen-inch globes. At the aisle fronts of the central spaces are posts bearing lighted globes and vases of real flowers, while floral decorations are used effectively at other points. The iron girders which support the roof of the building are masked by massive pillars of a design in harmony with that of the fountains, while through the ceiling, which they support, project at intervals 500-watt tungsten lamps; this feature and other elements of the lighting scheme contributing to a greater brilliance throughout the show than has been secured heretofore.

Along the center of the Coliseum, running north and south, is a row of open arc lamps and hanging at a lower level directly under these is a row of flaming arc lamps. In each exhibit space is placed a 500-watt frosted globe tungsten lamp.

All available space is utilized for exhibition purposes, and on account of the coming commercial vehicle exhibition, next week, no commercial vehicles are shown. As in past shows, the main floors of all three buildings and the basement of the Annex are used for exhibiting cars and the balconies of the Coliseum and Armory and the second floor of the Coliseum Annex for motorcycles and accessories.

Electric vehicles and electrical equipment for the lighting and ignition of gasoline cars play a prominent part in the show, various firms making large and comprehensive displays. A significant feature is the number of gasoline cars shown equipped with electric lights.

Anderson Electric Car Company, Detroit, Mich., is exhibiting two broughams, two coupés and new roadster.

Babcock Electric Carriage, Buffalo, N. Y., is exhibiting a town car, coupés, victorias and roadsters.

Baker Motor Vehicle Company, Cleveland, O., is exhibiting coupés, runabouts, victorias.

Broc Electric Vehicle Company, Cleveland, O., is exhibiting a number of its 1911 electric pleasure cars, including two coupés and a victoria.

Columbia Motor Car Company, Hartford, Conn., is exhibiting among its gasoline cars a two-passenger electric landaulet.

Hupp-Yeats Electric Car Company, Detroit, Mich., is exhibiting three of its electric low-body coupés.

Ohio Electric Car Company is exhibiting a number of its new electrics which are being shown for the first time at an automobile show.

Rauch & Lang Carriage Company, Cleveland, O., is exhibiting its new model coupés, roadsters and victorias.

Studebaker Automobile Company is exhibiting its new four-passenger coupé and three-passenger victoria.

Waverley Company, Indianapolis, Ind., exhibited a number of its standard vehicles, including 1911 model coupés, roadsters and victorias.

Woods Motor Vehicle Company exhibited five of its 1911 model electrics, including coupés and victorias.

A detailed description of the 1911 model, standard electric vehicles will be given in our annual electric-vehicle issue, February 11.

ACCESSORIES.

American Ever Ready Company, New York, N. Y., is making a comprehensive display of Ever Ready batteries, lamps, etc.

Apple Electric Company, Dayton, O., is exhibiting a complete line of small dynamos, particularly adapted for low-voltage lighting and ignition, Alpco storage batteries and a complete line of lighting accessories.

Connecticut Telephone & Electric Company, Meriden, Conn., is exhibiting a line of Connecticut four-cylinder magnetos and parts. An interesting feature of this exhibit is a stand equipped to represent the driver's seat of a car with all necessary connections made.

Diamond Rubber Company, Akron, O., is making a comprehensive display of rubber goods which includes raw rubber, rubber insulating material and a complete line of Diamond tires.

Joseph Dixon Crucible Company, Jersey City, is showing a full line of graphite products and lubricants.

Edison Storage Battery Company, Orange, N. J., is making a comprehensive display of Edison vehicle batteries and parts. A complete line of plates are shown and a standard battery is exhibited dissembled.

Electric Storage Battery Company, Philadelphia, Pa., is exhibiting a number of characteristic types of Exide vehicle batteries mounted in standard trays adapted for different electric vehicles. There is also shown a column of standard sizes of ignition batteries as arranged for various types of cars. The new Ironclad-Exide battery is also shown.

Lovell - McConnell Manufacturing Company, Newark, N. J., is showing a complete assortment of Klaxon warning signals.

The National Carbon Company, Cleveland, O., has a very interesting exhibit, which, aside from its extensive line of dry cells and a set of various sizes of Columbia multiple batteries, contains an ingenious testing board for testing at one time four different batteries and igniters. The testing outfit as shown is adjusted for twenty-three miles per hour.

The Remy Electric Company, Anderson, Ind., is exhibiting a complete line of its high-tension alternating-current magnetos.

The Stromberg Motor Devices Manufacturing Company, Chicago, Ill., is showing a complete assortment of its carburetors. A feature of this exhibit is an exaggerated working model of a carburetor.

The United States Light and Heating Company, New York, N. Y., is showing a number of truck and vehicle batteries and also a completed line of lighting and ignition batteries for gasoline cars.

Current Electrical News

GREAT BRITAIN.

(Special Correspondence.)

LONDON, JANUARY 21.—A further development is about to take place in connection with the single-phase railway at South London, which has proved such a conspicuous financial success. At present the line working on this system is in the form of a semicircle linking one terminus of the company in London with another. The next move is to carry a branch from this on to the Crystal Palace, and in addition a straight stretch some ten miles out to Croydon, is also to be converted. Already rumors have been heard of the intention to adopt the single-phase system to the line all the way to Brighton, the popular watering place on the South Coast, a distance of over fifty miles, and the extension to Croydon is a commencement of this task.

A very fine example of electric lighting has been installed in the new Palladium Theater of Varieties, which was recently opened in London. Tantalum lamps are used, the lighting pressure being 110 volts. Holophane globes also play a large part in the scheme, and a very fine effect is produced by some fifty-light electroliers, each about twelve feet in depth and nine feet wide. G.

CONTINENTAL EUROPE.

(Special Correspondence.)

PARIS, JANUARY 18.—A hydraulic plant has lately been installed in southwestern France which ranks among the large European stations. It is intended to supply current to Bordeaux and other large towns as this region, and works on extensive power network. The plant is located on the Dordogne River and the total output of the machines which are installed is 30,000 horsepower, including an extensive steam plant with Curtis turbine and alternator sets of 4,500 horsepower. This latter serves as a reserve. A feature to be noted is the use of a bear-trap dam, this being one of the few in Europe. Another as used at the Chevres hydraulic plant on the Rhone near Geneva. The hydraulic condition on the Dordogne made this necessary, esecially the very heavy freshets which sometimes occur. In this case the gates must be entirely open, so that the turbines are out of action and the steam plant does all the work. The steam plant contains a boiler house equipped with sixteen boilers of the Buttner type, and a well-designed coal-conveying plant is installed, using automatic stokers for the boilers. In the machine room are erected two Curtis steam-turbine groups of 4,500 horsepower each, with Thomson Houston alternator built at the Paris shops. These machines work at 5,000 volts, three-phase, and the whole plant is operated by an extensive forty-one-panel switchboard. A separate building contains the transformers and the fitting for the outgoing power lines. These latter are operated at 13,000 volts and 55,000 volts.

Extensive preparations are being made in Italy for the coming expositions at Rome and at Turin. The former opens March 27 and the second on April 29, lasting until the end of November.

At the last meeting of the Academie des Sciences, Prof. Urbain of the Paris University brought out his researches which led to the discovery of a new element, and this he calls "celtium." It will be remembered that the same scientist found the element lutecium about two years ago. He obtains the present new element from the mineral gadolinite in the state of chloride, and has determined its spectrum and magnetic constants.

In Austro-Hungary I note a new central station which is to be erected at Rossitz, which lies in an extensive coal mining center. It will be operated in connection with a power network for the region.

The Upper Rhine Hydraulic Power Company is extending its operations in Alsace and in addition to the thirty-two communes which it is now supplying with light and power it is taking measures to supply others. To this end it has purchased the steam plant of Turckheim, and this locality will henceforth be supplied by a power line, using current from the Rheinfelden hydraulic plant. The steam plant will serve as a standby in the future. A. DE C.

EASTERN CANADA.

(Special Correspondence.)

OTTAWA, ONT., JANUARY 28.—The Canadian Pacific and the Northern Navigation steamers will be equipped with wireless for service on the Great Lakes.

Local shipowners in the city of Toronto are considering the installation of the wireless on their large steamships, and when in service next summer will be in constant touch with the Marconi station recently established at Port Arthur, Ont.

A bill will be introduced into the Canadian Commons by the Minister of Marine providing that all passenger vessels, making trips extending 200 miles or over must be equipped with wireless apparatus. This means that all vessels doing business on the Great Lakes, or on any large inland body of water, as well as ships doing a coasting business, will have to be so equipped.

Sir William Van Horne is on the directorate of the Grand Falls Power Company of the Province of New Brunswick. This company has secured the rights of a rival concern, and is now organized to go on with the development of great pulp and paper industries at Grand Falls, N. B.

Toronto and Montreal capital is interested in the Central Canada Telephone Company, a newly organized concern that will construct and operate a telephone line from a point at or near Fort William, Ont., to the Manitoba boundary, and forming a rural and urban system. Application has been made for incorporation.

Hon. Adam Beck, chairman of the Ontario Hydro-Electric Commission, reporting to the City Council of Kingston, Ont., holds out hopes of making favorable arrangements for the use of Waddington, N. Y., power for Kington. Plans and estimates of cost are now being prepared by experts. As soon as the figures of the cost are received, there will be another meeting of the municipalities of Eastern Ontario to determine what, if any, action shall be taken in the matter. W.

WESTERN CANADA.

(Special Correspondence.)

WINNIPEG, CAN., JANUARY 26.—The municipal electric light plant at Strathcona, Alberta, hes been found to be totally inadequate for the needs of the city. One of the first acts of the new City Council was to instruct City Engineer Ewing to prepare specifications of the machinery needed to increase the capacity and his report has been presented and accepted. He estimates it will cost $72,000 for new machinery. This includes the following items: 600-kilowatt generator, $14,300; accompanying engine, $20,000; boilers, $32,000; enlarging building, $5,000, and the balace for incidentals. Provision will also be made that a turbine may be installed later on. Alderman Richards is chairman of the light and power committee.

It is announced that the Calgary Power Company, of Calgary, Alberta, which is building a plant at Kananaskis, in the vicinity of that city will be placed in operation on April 1.

Fully as much, probably more, telephone construction will be done in Alberta this year by the provincial government as during 1910, when over 1,000 miles of new line were strung. Deputy Minister of Public Works, J. W. Stokes, is now at work arranging the programme and the plans will be announced during the next week or two. The lines constructed last year give telephone communication to practically every town on all the railroads operating in the province.

The Dominion Government has just completed the final link in its circle of telephone lines in British Columbia which connects Kamloops, Nicola, Hedley, Penticton, Kelowna, Vernon and from thence again to Kamloops. The "circle" is 372 miles in length and consists of over 500 miles of wire and is said to be the longest single wire telephone line in the world. There are over fifty offices and agencies on the system connecting with the outside world to the east, west and south.

The City of Prince Albert, Saskatchewan, has received permission from the Dominion Government to develop power in the Saskatchewan River to the north of the city and plans and specification are now being prepared in order that a start may be made this spring. Address Alderman S. McLeod or Mayor Holmes.

The civic estimates of Edmonton, Alberta, for 1911, include $130,000 for extensions and improvements to the telephone system which is now worked to capacity. Address Superintendent Griffiths.

An interesting report has recently been prepared by J. B. Challies, C. B. of the Department of the Interior at Ottawa. It shows the minimum flow of development of Canada's water power to be 25,682,907 horsepower. He will shortly revise this estimate when it is expected the figures will show a substantial increase. A careful calculation shows that the maintenace of one horsepower per annum from steam power involves the consumption of 21.9 tons of coal. On this basis the available water power of Canada represents a combined energy, if it were being generated by coal and steam, involving the consumption of 562,455,633 tons of coal annually.

The City of Portage la Prairie, Manitoba, is considering the installation of a municipal electric lighting plant.

The Alberta Government has decided to build a long-distance telephone line from Athabasca Landing to Fort McMurray, a distance of over 200 miles. An extension will also be built into the Grande Prairie country. Work on both lines will start this spring. The recent blizzards played havoc with the provincial government lines into the north country. K.

COMMISSION NEWS FROM NEW YORK.

(Special Correspondence.)

The Public Service Commission has received five petitions from the New York Telephone Company in relation to the sales and mergers of the plants controlled by that company. A corporation has been formed known as the Allegheny Telephone Company, located at Wellsville, to which it is proposed to sell the plant and property of the New York Telephone Company situated in Allegheny County, including the rights and privileges granted to the New York and Pennsylvania Telephone and Telegraph Company, the predecessor of the New York Telephone Company, by the villages of Wellsville and Andover. The price to be paid is $35,000.

It is also proposed to sell the Amsterdam Automatic Telephone Company to the New York Telephone Company, for $150,000.

The New York Telephone Company proposes also the merger of the Trumansburg Telephone Company, the stock of which is owned by the New York Telephone Company at present.

Application is also made for permission to merge the Jefferson County Telephone Company into the New York Telephone Company, the whole of the stock of the Jefferson County Company being owned by the New York Company at present.

Representatives of the Monticello Telephone Company appeared before the Commission against the Murray Electric Light & Power Company, complaining that the lines of the lighting company were dangerous and interferred with the Telephone Company's operations. The attorney for the Electric Light Company answered the order to show cause which was directed against the Murray Company by the Commission, as to why that company should not be required to make its equipment safe and adequate. He said the Company had been using poles jointly with the telephone company, but would do so no more.

In his annual report to the State Water Supply Commission, Walter McCulloh, consulting engineer of the Commission, gives the results of water storage and power surveys made during the year on the Black River, the Oswego-Seneca Rivers and their tributaries including the Finger Lakes, a power survey of the Hudson River from Hadley to Troy and a power survey on the Genesee River at Mount Morris and Rochester. Speaking generally of the water power possibilities within the state the report says:

"With the Niagara developments at the western end of the state, the Hudson developments at the eastern end and the developments on the Genesee, Oswego and Black Rivers and Canada Creeks, there is evidently enough power available to make New York the manufacturing center of the United States. When this fact is considered in connection with the magnificent and unexcelled transportation facilities by canal and rail alongside of which this power may be delivered, and the large urban population in the midst of which the power can be used, thus insuring a labor supply, it is clear that the only thing preventing New York State from becoming such a center is New York State herself."

After studying the natural conditions and the water storage provided for by the Barge Canal plans, the report concludes that the total additional water power that can be developed upon the Oswego River system is 12,200 continuous horsepower.

Two large storage reservoirs at Hawkinsville and at Higley Mountain are shown to be practicable upon the Black River.

The Hawkinsville reservoir would impound 5,700,000,000 cubic feet of water and its estimated cost is $2,850,000. The plans do not involve the use of state lands lying within the Adirondack Park line. The Higley Mountain reservoir has a capacity of 5,200,000,000 cubic feet of water and would cost $1,340,000. It would cover 4,290 acres of which 3,590 are State lands within the Park line. The Hawkinsville reservoir would add 7,915 continuous horsepower to the flow of the Black River below Lyons Falls and the Higley Mountain reservoir would add 7,200 continuous horsepower.

COMMISSION NEWS FROM WISCONSIN.

(Special Correspondence.)

The Commission has authorized the Northern Hydroelectric Company to issue $300,000 par value of bonds, of the denomination of $1,000 each, to bear interest at the rate of six per cent per annum. The issue is to be made in accordance with the terms of a mortgage deed of trust issued to the American Trust and Savings Bank and Frank H. Jones, as trustee and co-trustee. The funds derived from the sale are to be used for the purchase of machinery and for the purpose of completing the company's plant at High Falls, Marinette County, Wis.

The Chippewa Valley Railway, Light & Power Company has filed modified rates for lighting churches in the city of Elk Mound, Wis. This is an emergency rate and is ten cents per light per month for the first five fifty-watt equivalents and five cents per light per month for each additional fifty-watt equivalent. The Minahan Building Company, of Green Bay, has filed a rate for a new service in that city. This service is private street lighting and the rate covers the erection, connection and maintenance of iron poles, each supporting five 100-watt tungsten lamps with enclosed globes, lighted every night from dusk to midnight for $6.00 a month. The Stoughtom Municipal Electric Light System has asked authority to put into effect a special rate for current used by small motors used in storing ice. This service only lasts two weeks in a year. The rate suggested is five cents per kilowatt-hour, with a minimum bill for a ten-horsepower motor of $35.00 per annum.

COMMISSION NEWS FROM NEW JERSEY.

(Special Correspondence.)

The Board of Public Utility Commissioners for the state of New Jersey has adopted as a uniform system of accounting for electric street railway companies the classification of operating expenses, operating revenues, and expenditures for road and equipment, prepared as standard by the American Street and Interurban Railway Accountants' Association, October 15, 1908, with certain modifications.

The modifications apply particularly to the keeping of accounts for depreciation of way and structures and depreciation of equipment.

The Board requires that in the account for depreciation of way and structures there shall be charged from month to month the amount estimated to be necessary to cover such wear and tear, obsolescence and inadequacy as have accrued during the month on all way and structures of the accounting corporation, less an amount equal to the sum of the amounts charged for that month to the various repair accounts in maintenance of way and structures. For depreciation of equipment the Board requires a charge to be made from month to month of the amount estimated to be necessary to cover wear and tear obsolescence and inadequacy accruing during the month on equipment. From this there is to be deducted an amount equal to the sum of all the amounts charged during that month to various repair accounts in maintenance of equipment. The amount estimated to be necessary to cover wear and tear, obsolescence and inadequacy for both maintenance of way and structures and depreciation of equipment is to be based on a rule to be determined by the accounting corporations which rule is to be derived from consideration of the corporation's history and experience. A general statement of the rule in use by each company, together with the general information upon which it is based, is to be filled with the Board.

The Board has also approved the ordinance of the Township of Deptford granting a franchise to the Gloucester County Electric Company.

Each railroad company operating in the state must, according to a recent order of the Board, file within thirty days, a statement setting forth: (1) the total mileage of railway operated within the state; (2) the mileage operated by block signals; (3) the proportion of mileage, so protected, operated by automatic block signals.

Investigation of complaints of charges for metered service shows that such complaints, in some instances, were based upon the misreading of meters by consumers.

To obviate this situation, and to provide a check upon misreadings by the inspectors of the companies, instances of which have come to its attention, the Board of Public Utility Commissioners recommends: (1) that every bill rendered for metered service have printed thereon a brief, but clear, description of the method of the reading of meters, or that some other equally effective means be employed to make such knowledge general; and (2) that every such bill show (a) the reading of the meter upon which the charge is based, and (b) the last preceding reading.

COMMISSION NEWS FROM MISSOURI.

(Special Correspondence.)

The Union Light & Power Company of St. Louis, appeared before the Public Service Commission of Missouri in an effort to have the valuation of the company's property increased so that sufficiently high rates might be charged to realize a profit on the investment. While the company admitted that the construction of its physical property cost only $23,411,866.55, it contended that it should be allowed to charge on the reproduction cost and the cost of building up the business to its present status. This would bring the valuation up to $30,000,000. In a brief prepared by the company it was shown that even on a valuation of $23,441.866.55 and considering that eight per cent was a fair return, the present figures showed a total deficit of $5,738,368.59 at the end of 1908. On this basis there has been an investment of at least $29,000,000.

A comparison made with the rates of companies operating in Brooklyn, Boston, New York and Chicago showed that these were substantially higher than those prevailing in St. Louis.

An estimate of cost made by Ford, Bacon & Davis put the value of the plan at $26,000,000, and the cost of putting the plant and business in the present condition brought the figure to $30,000,000; these figures being the basis of the Company's contention. No account has been taken of franchises, although these are taxed at a value of $5,000,000.

J. D. Mortimer in his testimony stated that he considered four points essential in making rates, these being as follows: (1) The cost to the company of rendering service including a reasonable return on the investment; (2) the development and extension of the business; (3) competition with other purveyors of heat, light and power; (4) the avoidance of charges distasteful to customers, as for instance, minimum charges and service charges. Others who appeared before the Commission in the company's behalf were Charles F. Uebelacker, William von Phul, Mortimer E. Cooley, Alten S. Miller and Carroll Miller. The Commission took the testimony presented under advisement and will report to the Municipal Assembly in a short time.

LIGHTING AND POWER.

(Special Correspondence.)

MENNO, S. D.—A franchise has been granted to Peter A. Orth to install an electric light system.

IRON MOUNTAIN, MICH.—The Oliver Iron Mining Company is building a power dam at a cost of $750,000. C.

STRATHCONA, ALTA.—The new machinery for the electric light plant, approximating $65,000 is recommended. C.

SAN DIEGO, CAL.—J. D. Spreckels has obtained a franchise to extend an electric line from Old Town to La Jolla. A.

GLENDALE, CAL.—Chas. E. Salisbury has applied for a franchise for an electric street railway between here and Burbank, Cal.

INTERNATIONAL FALLS, MINN.—The Minnesota & Ontario Power Company will build a dam to develop power at Kettle Falls. C.

PERU, IND.—The City Council has decided to install considerable new machinery and equipment in the municipal electric light plant. S.

HENRY, S. D.—The Council has granted a franchise for the installation of an electric light system to the Henry Light & Power Company. C.

COAL CITY, ILL.—The Economy Light & Power Company is preparing to build a new fireproof buidling of brick and steel for its local plant. Z.

ENTIAT, WASH.—Geo. D. Brown, president of the Chelan Falls Commercial Club, will install electric power stations here and at Chelan Falls. C.

BURLINGTON, IOWA.—The construction of a power plant to develop 50,000 to 100,000 horsepower, is being agitated. J. W. Albright is interested. C.

SHAKOPEE, MINN.—The contract for the installation of a triplex pump at the electric light plant has been let to J. G. Robertson, St. Paul, Minn. C.

SUISAN, CAL.—The new electric railway, known as the Oakland & Antioch Railway, will be completed to Concord and Walnut Creek by February 1.

FT. WAYNE, IND.—A company headed by Henry B. Monger is seeking a franchise to install and operate a new central-station heating system in the business district of this city. S.

ST. LOUIS, MO.—The Franklin Avenue Improvement Association has appointed a committee to get more lights, composed of Charles Niedringhaus, Sam Goldman and Henry Mauch.

BALTIMORE, MD.—Preliminary plans are being prepared for a power house which is to be built for the American Tobacco Company. The structure will be of brick and will cost about $25,000.

BLUFFTON, IND.—The City Council will soon ask for bids for equipment, including a new complete engine, for the municipal electric light plant. The previous attempt to buy an engine had been declared illegal. S.

SAUGATUCK, MICH.—Saugatuck is planning to put in an electric light plant. The question will be decided in a special election to be held soon. About $8,000 will be necessary for the plant, it is estimated.

SAVANNAH, GA.—The Savannah Lighting Company has made application in the Superior Court for right to increase its capital stock limit from $500,000 to $2,000,000. The company finds that the original amount fixed is too small for present needs.

BEDFORD, IND.—The City Council has decided to install a complete electric pumping system at the water works pumping station. Plans are being prepared by W. L. Hurd, chief engineer of the Indianapolis Water Works. S.

ANOKA, MINN.—The Great Northern Development Company of Duluth, Minn., has been authorized to construct a dam at Coon Rapids, which, with the one to be constructed here, will develop 35,000 horsepower. C.

EAST ST. LOUIS, ILL.—The Light Committee of the Retail Merchants' Association has been named for 1911 as follows: H. C. Thoene, C. F. Merker, F. Giessing, J. M. Chamberlin, M. Esserman, W. W. Meyer, T. L. Fekete, B. Haumesser and T. M. Carter. Z.

OAKLAND, CAL.—The Southern Pacific Railroad Company has been granted a fifty-year franchise on Seventh Street. The ordinance granting the privilege provides for a division of the net profits of the line on a basis of seventy-five per cent to the railroad. A.

ROCKFORD, ILL.—The Chamber of Commerce has appointed the following committee to push the plan for installing boulevard lights in the business section of Rockford: Chairman, Fred E. Sterling; C. F. Henry, F. S. Datin, John V. Riley, J. C. Peters, Harry Pollard and A. E. Freburg. Z.

EL CENTRO, CAL.—The Holton Power Company will soon begin at El Centro the construction of the steam plant for the generation of electric power and light, and the plant will be ready for operation in the fall. The plant will generate about 1,000 kilowatts and will cost approximately $250,000.

EBENSBURG, PA.—The Ebensburg Light, Heat & Power Company has increased its capital stock from $50,000 to $100,000. It is said most of the money will be expended in improvements, including two new dynamos to replace the two old ones in use. Other improvements may be made at the plant.

SPRINGFIELD, O.—The executive board of the Osterlin Orphans' home is considering the installation of an electric light plant at that institution.

OGDEN CITY, UTAH.—A. L. Brewer, J. S. Lewis, M. S. Browning, Joseph Scowcroft, J. N. Spargo and A. T. Wright, all prominent business men of Ogden, have petitioned the City Council for a franchise to erect an electric light plant and build pole lines to supply the city with electric light, power and heat. They also agree to furnish the current for ten cents per kilowatt-hour which is one cent less than the present company charges and to furnish street arcs for $6.00 less than the present company per year. N.

REDMOND, ORE.—Redmond is now lighted by electricity. The plant is operated by the Crook County Water, Light & Power Company, a local concern, and the power is generated at the pumping plant of the city water system. The company plans bringing in a transmission line from its power plant at Cline Falls, four miles west of here on the Deschutes River, to increase the service.

VINCENNES, IND.—The Vincennes Electric Company has incorporated with a capital of $20,000. The object of the corporation is to generate, sell and rent electric current for heating, lighting and power purposes, and to install electric wiring and appliances and to deal in devices for the service of electricity. The incorporators are Albert J. Heintz, Vincennes, and Wm. T. Barnes and Charles W. Sherman, of Massachusetts. S.

SEYMOUR, IND.—The Seymour Public Service Company, a new organization controlled by Milwaukee capitalists, now has possession of the gas and electric lighting franchise in Seymour. The Company, which has just been incorporated, has purchased the plant and gas franchise of the old Seymour Gas and Electric Light Company and the franchise of the Seymour Public Utility Company, which obtained a franchise from the City Council several months ago along with a contract for the electric lighting of the streets of the city. E. A. Potter, of Chicago, is president and general manager of the new company. The work of rebuilding the old plant has been in progress for some time.

ELECTRIC RAILWAYS.

(Special Correspondence.)

EVELETH, MINN.—Work has been started on the survey for an interurban to Virginia. C.

BURLINGTON, IOWA.—The construction of an interurban line next summer to Salem, Iowa, is projected. C.

JAMESTOWN, N. D.—The construction of an electric line between the city and the state hospital is projected. C.

BOTHELL, WASH.—The Seattle, Snohomish & Everett Railway Company, of which Chas. W. Kimball is president, will build twelve miles of interurban track to Seattle. It is intended to extend the line to Snohomish and Everett. C.

INDIANAPOLIS, IND.—The East Michigan street car line has been ordered by the Board of Public Works to be extended to Emmerson Avenue. This extension will afford transportation for several thousand people and ends a long contention. S.

MILWAUKEE, WIS.—The Milwaukee Western Electric Railway, of which Alvin P. Kletszch is president, has secured all but twenty-five per cent of the right-of-way for its line to Fox Lake, and the company expects to start construction as soon as the frost is out of the ground. C.

BRIDGEPORT, CONN.—More than half of the right of way for the new Bridgeport-Danbury trolley line has been purchased, and $10,000 worth of rails have already been laid on the proposed route in Bridgeport and its outskirts. The road's construction is to be pushed with all possible speed and at least part of it opened this year.

TERRE HAUTE, IND.—In a petition for the vacation of Cherry Street on which to erect a terminal passenger station the Terre Haute, Indianapolis & Eastern Traction Company announces that it will abandon its present power house in Ninth Street and centralize the plant by building a large addition to the power station near the river. S.

VANCOUVER, WASH.—The Oregon-Washington Corporation, formed here on December 9, 1910, has bought out the Vancouver Waterworks, the Vancouver Traction Company and the Vancouver Gas Company. B. M. Atkins, who has been the manager of the Vancouver Traction Company for several years, will have the supervision of all the Vancouver holdings.

BEAUMONT, TEX.—It is announced by James F. Weed, receiver of the Beaumont Traction Company, that if the Federal Court here grants his application for authority to accept the new franchise granted the Company by the City Council and to issue $125,000 of receiver's certificates he will make important extensions of the lines of the system. D.

KOKOMO, IND.—At the annual meeting of the directors of the Kokomo, Marion & Western Traction Company January 23. George

J. Maroll was selected president, L. J. Kirkpatrick, vice-president, and T. C. McReynolds, secretary-treasurer. The gross income of the properties during 1910 was $261,485. The net income after operating expenses were deducted amounted to $148,099.85.

INDIANAPOLIS, IND.—The Indianapolis, Nashville & Southern Traction Company has been incorporated with a capital stock of $150,000, to build an electric line from Indianapolis to Nashville, Bloomington, Bedford, Mitchell, Paoli, French Lick and Evansville. The incorporators are John A. Johnston, Thomas F. Wakeland, John A. Shafer, Robert J. Espy and George W. Long.

TULSA, OKLA.—Charles Page, a wealthy oil man, has asked the city for a franchise for an interurban railway which will connect Tulsa with a large amusement park to be built and maintained by Mr. Page. The road and park which will cost $250,000, are designed as a source of revenue for the Sand Springs Home for Orphan and Dependant Children of which Mr. Page is founder and sole supporter. Z.

SAN ANGELO, TEX.—At a meeting of the stockholders of the San Angelo Street Railway Company held here on January 14, John W. Harris was elected president to succeed Sam Crowther and Charles B. Metcalf, secretary and treasurer. If the effort that is now being made to bond the property for $50,000 succeeds, extensions and improvements will be made. If the bonding proposition is not put through the property will be foreclosed early in March to satisfy a judgment of $30,000 held by Mr. Crowther against the company. D.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

PANA, ILL.—The Christian County Telephone Company will rebuild its lines here next summer. Z.

RED CLOUD, NEB.—The East Garfield Telephone Company has been incorporated with a capital of $10,000. P.

BEDFORD, IND.—The Home Telephone Company of this place has been taken over by the Bell Telephone Company.

MANHATTAN, ILL.—The Manhattan Telephone Company plans to acquire the lines owned by farmers in this vicinity. Z.

RED CLOUD, NEB.—The Nebraska & Kansas Telephone Company has been incorporated with a capital stock of $10,000. P.

EDMONTON, ALTA.—The telephone department of the city will expend $130,000 during the present year in improvements. C.

THERMOPOLIS, WYO.—The Bell Telephone Company will expend $10,000 in rebuilding and improving its telephone system. C.

BRIDGETON, IND.—The Citizens Telephone Company has elected officers for the ensuing year as follows: President, John R. Mitchell, secretary, Freeman Sellers; treasurer, F. M. Miller. S.

WINCHESTER, IND.—The Farmers Telephone Company has been incorporated to build and operate a telephone system in Randolph County. The incorporators are Olynthers Lesley, Leander Moorman, Clarence Mullen and David Lesley. S.

GAY, GA.—The Gay Telephone and Telegraph Company, of this place, is shortly to be organized. The application for a charter has been filed by C. D. Freeman, of Griffin, Ga.; J. R. Gay, Roy Couch, S. R. Williams and W. A. Estes, of Gay, and W. P. Ellis, of Oakland, Ga. I.

CENTER, IND.—The Center Telephone Company has incorporated to build and equip an exchange in Center and extend the lines throughout Howard County. The capital stock is $10,000. John Ingals, Elmer Thomas, Center, Ind., and Wm. E. Schenk and C. J. Faulk, Kokomo, Ind., are directors. S.

PORT ARTHUR, TEX.—The City Council of this place has declined to reconsider its recent action in refusing to grant a franchise to the Southwestern Telegraph and Telephone Company to install a local exchange here in opposition to the Independent Company which now occupies this field. D.

JEFFERSON CITY, MO.—Representative Simmons of Shelby County has introduced a bill in the lower house of the Missouri legislature regulating rates on night long-distance telephone calls. Under the proposed law rates from 7 p. m. to 7 a. m. shall not be more than one-half of the rate between 7 a. m. and 7 p. m. Z.

TRAER, IOWA.—A new telephone company is to be organized with $60,000 capital to take over the property of the Mutual Telephone Company, operating exchanges in Traer, Reinbeck and Gladbrook. Old directors of the company, R. M. McElhinny, R. C. Wood, John Sherret, F. C. Van Vliet and Adolph Moeller were elected to serve until the transfer is made. Z.

LUCKEY, O.—At a recent meeting of the stockholders of the Webster Telephone Company, at this place, the following officers were elected: Manager, James Rogers; president, W. L. Kurfess; secretary and treasurer, J. D. Philo; directors, G. F. Claus, Thomas Fuller, Milo Jameson and W. A. Philo. Plans for improvements were considered and practically decided upon. H.

KLAMATH FALLS, ORE.—W. J. Phillips, division commercial superintendent for the Pacific Telephone Company, states that within a few months his company expects to commence work on the complete remodeling of the plant here. The work contemplated will entail an expenditure of over $30,000. A.

ELECTRICAL SECURITIES.

The week was in general marked by dullness, although the price of securities had a distinctively upward tendency. Although both the Standard Oil and American Tobacco cases are still to be considered, there seems to be but little fear that present conditions will be disturbed to any great extent. The common stock of the United States Steel Corporation showed an advance of one and three-quarter points during the week, the transactions in that security constituting about two-sevenths of the total sales. Steel, Reading and Union Pacific together furnished about fifty-six per cent of the week's transactions on the Stock Exchange.

Oak Park Elevated Railroad directors have been re-elected.

The New York Stock Exchange has received notice of the proposed increase of $1,400,000 in the common stock.

The annual meeting of the Detroit Edison Company will be held at 30 Broad Street, New York, February 6.

At the annual meeting of the United Railways, of St. Louis, directors were re-elected.

The annual meeting of the American District Telegraph, of New York, has been set over until the third Tuesday in February. The American District Telegraph, of New Jersey, will hold its annual meeting the second Tuesday in February.

William A. Read & Company, New York City, have bought and resold $1,500,000 five-per-cent collateral trust gold notes of the Detroit United Railways, dated February 15, 1911, and due January 1, 1912. The notes are secured by $1,800,000 of the company's first consolidated four-and-one-half-per-cent bonds and other collateral. A syndicate of Montreal bankers has contracted to purchase $1,500,000 first consolidated four-and-one-half-per-cent bonds, which were offered to stockholders, at such times as the company may demand.

At the annual meeting of stockholders of the Duluth-Superior Traction Company, held in New Haven, the retiring directors were re-elected. At a meeting of the board the former officers were re-elected, and the number of vice-presidents was increased from one to two. A. E. Ames, of Toronto, was elected to the new office.

DIVIDENDS.

Philadelphia Company; semiannual dividend of two and one-half per cent, payable March 1.

Susquehanna Railway, Light & Power Company; preferred semiannual dividend of two and one-half per cent, payable March 1.

Twin City Rapid Transit Company; regular quarterly dividends of one and three-quarter per cent on the preferred and one and one-half per cent on the common stock; the preferred payable April 1 to stock of record March 15; the common payable April 1 to stock of record March 11.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

NEW YORK.

	Jan. 30.	Jan. 23.
Allis-Chalmers common	7⅞	8
Allis-Chalmers preferred	31	28½
Amalgamated Copper	62½	64¼
American Tel. & Cable	82	*82
American Tel. & Tel	144⅛	143½
Brooklyn Rapid Transit	77¼	77
General Electric	152	151
Interborough-Metropolitan common	18½	19
Interborough-Metropolitan preferred	53⅛	53
Kings County Electric	123	123
Mackay Companies (Postal Telegraph and Cables) common	90	92
Mackay Companies (Postal Telegraph and Cables) preferred	74½	74¾
Manhattan Elevated	138	138
Metropolitan Street Railway	*18	*18
New York & New Jersey Telephone	103	103
Pacific Tel. & Tel	53½	51¾
U. S. Steel common	78⅝	77
U. S. Steel preferred	119¼	118¾
Western Union	74½	74¾
Westinghouse common	66	67½
Westinghouse preferred	116	110

*Last price quoted.

BOSTON.

	Jan. 30.	Jan. 23.
American Tel. & Tel.	144	143½
Edison Elec. Illuminating	290	287½
General Electric	151½	151
Massachusetts Electric common	17½	18
Massachusetts Electric preferred	85	85
New England Telephone	137	137½
Western Tel. & Tel. common	18½	18
Western Tel & Tel. preferred	90½	88

PHILADELPHIA.

	Jan. 30.	Jan. 23.
American Railways	45	44¾
Electric Company of America	12¼	12½
Electric Storage Battery common	53½	54⅛
Electric Storage Battery preferred	53½	54⅛
Philadelphia Electric	16¼	16
Philadelphia Rapid Transit	20¼	20⅞
Philadelphia Traction	86½	86½
Union Traction	47¾	48¼

CHICAGO.

	Jan. 30.	Jan. 23.
Chicago Railways, Series 1	90	93
Chicago Railways, Series 2	24½	24
Chicago Subway	4	4
Chicago Telephone	118	118
Commonwealth Edison	113	113
Metropolitan Elevated common	21	21
Metropolitan Elevated preferred	66½	67

PERSONAL MENTION.

HAROLD KIRCHBERG, formerly with the Pennsylvania Railroad as illuminating engineer, has severed his connection with that company and is now connected with the Heany Company, Novelty Incandescent Lamp Company and Tipless Lamp Company. Mr. Kirschberg is located at 1733 Broadway, New York City.

THEODORE N. VAIL, president of the American Telephone & Telegraph Company, is to give to the Presbyterian Church of Whippany, N. J., between thirty and forty acres of land as an addition to the church cemetery. He has bought an adjoining farm in order to carry out his plan. His parents, his wife and a son are buried in the cemetery.

ELMER P. MORRIS, one of the pioneer electrical contractors of New York City, has made arrangements whereby the ornamental lighting manufacturing business conducted under his name, will be continued as The Morris Iron Company, 86 West Street, New York City. The new company will have greatly enlarged facilities and the management will be in the same hands as formerly, Elmer P. Morris becoming vice-president and general manager.

J. W. CUSHMAN, who for some time past has been special representative of the Fostoria Incandescent Lamp Company in North and South Carolina, has taken up a new position with the same company in Pennsylvania, where it is trusted that the climate will agree better with Mr. Cushman's health. E. V. Plane, the Fostoria representative in Georgia and Alabama, has taken Mr. Cushman's place in the Carolinas, while W. M. Tibbs, who for a number of year's has been affiliated with various electrical interests in Knoxville, Tenn., will continue Mr. Plane's work in the Middle South.

E. T. PARDEE, formerly manager of the Boston office of Allis-Chalmers Company, has been made manager of the company's power and electrical department. He is well qualified for this position, having been actively connected with the selling of power and electrical apparatus during most of his business life. Mr. Pardee began his business experience with the Western Union Telegraph Company at Syracuse, New York, with which company he was connected from 1885 to 1891, following this he represented the Fort Wayne Electric Corporation at Omaha and San Francisco from 1891 to 1898, being advanced in the latter year to manager of the Boston office, which position he held until 1901. In that year he entered the Boston office of the Bullock Electric Manufacturing Company as a salesman and remained with Allis-Chalmers Company in a similar capacity after it had acquired the Bullock Company. He was made manager of the Boston office of Allis-Chalmers Company in 1905. Mr. Pardee will be succeeded as manager of the Boston office of Allis-Chalmers Company by T. J. Lynch, who for the past seven years, has been manager of the Toronto office of Allis-Chalmers-Bullock, Limited.

R. M. VAN VLEET, who has been the Chicago manager of the Cutler-Hammer Manufacturing Company for the past six years, has resigned that position to accept a position of responsibility in the executive offices of the same company at Milwaukee. Mr. Van Vleet is a man who has made his own way in life from boyhood, a graduate of the Westinghouse students' course at Pittsburg. After graduation he was employed for a time on construction work, and at the age of twenty was the electrical engineer for a steel shipbuilding company. He entered the employ of the Cutler-Hammer Manufacturing Company at Pittsburg in 1903. In 1904 he was transferred to Chicago as manager of that office. His six years' experience with the company has fitted him most admirably for his new position. Mr. Van Vleet has been especially prominent in the Order of Rejuvenated Sons of Jove, holding the office of Mercury for two years, and has been one of the most active members of the Chicago Electric Club. He is also a member of the Chicago Automobile Club. Just before he left for Milwaukee, Mr. Van Vleet was called into the office of the Sons of Jove, where H. L. Dawson, on behalf of the Chicago office of the Cutler-Hammer Manufacturing Company, presented him with a handsome chafing dish set of copper and circassian walnut as a mark of the esteem in which he is held by his office associates. "Van" will continue his good work; he is one of the cleanest, most-esteemed men in the business, and a host of friends and acquaintances in Chicago wish him good luck and congratulations.

R. M. VAN VLEET.

OBITUARY.

ERNEST BENSON PRIOR, roadmaster of surface lines for the Brooklyn Heights Railroad Company, died in St. Mary's Hospital, Brooklyn, N. Y., on January 26, from appendicitis. Mr. Prior was forty-seven years old.

GEORGE W. BIRDSALL died on January 22 in New York at the age of seventy-five years. Mr. Birdsall was appointed chief engineer of the city in 1881, retaining that office until 1902. He was then kept as consulting engineer of the Department of Water Supply, Gas & Electricity in which capacity he served until the time of his death.

LEGAL NOTES.

INDIANA WATERPOWER BILL.—A bill has been introduced in the Legislature which, if it becomes a law, will hasten the development of waterpower sites for generating electricity in Indiana. The bill provides that any franchise now held by any individual or corporation, where construction work for obtaining hydraulic power is not begun within six months, is void. Owners of waterpower sites are insisting that the time is too short and that the law will confiscate their property. S.

INDETERMINATE FRANCHISES LEGAL.—By handing down the decision that the indeterminate permit clause of the Wisconsin public utilities law is legal, the State Supreme Court upheld one of the most important powers had by the State Railroad Commission. The case was brought up by the Kenosha Railway Company, who contended that a certificate of public convenience and necessity from the Railroad Commission need not accompany a franchise secured from the City Council. The Company furnishing light for the City of Kenosha recently surrendered its franchise and took an indeterminate permit. Shortly after this the Railway Company obtained a lighting franchise from the City Council, but did not apply to the Railroad Commission for a certificate of convenience and necessity. The Lighting Company prevented the Railway Company from carrying out the provisions of its franchise by instituting in quo warranto proceedings, which resulted in the Railway Company appealing to the courts on the ground that the law was void. M.

THE TELEPHONE BUSINESS AND CONTRACTS IN RESTRAINT OF TRADE.—The business of a telephone company, in its broader aspects at least, is legally indistinguishable from that of a telegraph company, the telephone being a telegraph in all essential particulars. Wherever the character and functions of telegraph companies have been considered by the courts, the prevailing opinion has been that they are to be deemed public service corporations, affected by a public interest, and hence that contracts tending to restrict the free and general use of their lines are invalid. The same doctrine is equally applicable to the business of telephone companies. The feature of the modern telephone system which constitutes its public value and affects it with a public interest is its ability to bring each customer into vocal communication with hundreds and oftentimes thousands of others. This makes it an instrument of great public convenience and utility, the usefulness of the service offered by each company being directly proportionate to the number of persons who can be reached thereby. The franchise having been granted because of this very element—that is to say, the capacity to serve the community so generally by serving so large a number of individuals constituting the community—it cannot be tolerated that any grantee of the franchise shall exercise it in such a way as to lessen the value of the telephone as an instrumentality of service to the public. In return for the franchise which a telephone corporation receives from the state—including as it does the privilege of occupying highways and the right to exercise the power of eminent domain—it undertakes to furnish each customer with telephone service to as many other customers as it can obtain at the rates which the law permits it to charge; and the law implies an obligation on its part to do nothing to lessen the facilities of the public to procure a more widely extended service. It matters not that the customer may be willing to agree to exclude others or that the contract to do so is supported by a sufficient consideration as between the parties.

NEW PUBLICATIONS.

THE PRODUCTION OF MICA IN 1909.—This publication, compiled by Douglas B. Sterrett, deals with the properties of mica, its distribution in the United States and the purposes for which it is used. The statement is made that the electrical industry uses by far the greater part of the production of mica. Tables give the total production of mica in the United States during the year 1909, as 1,809,584 pounds, which was valued at $234,482.

BULLETIN OF BUREAU OF STANDARDS.—Vol. 6, No. 4 of the *Bulletin*, dated November, 1910, has recently been issued and contains a number of articles of electrical interest as follows: "Mica Condensers as Standards of Capacity," by Harvey L. Curtis; "The Mutual Inductance of Two Parallel Coaxial Circles in Terms of Hypergeometrical Series," by Frederick W. Grover; "A New Method for the Absolute Measurement of Electric Quantity," by Burton McCullom; "Photometric Units and Nomenclature," by E. B. Rosa; "The Comparative Sensitiveness of Some Common Detectors of Electric Oscillations," by Louis W. Austin. An abstract of the last named is given on other pages of this issue.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.—The Year-book of the Institute for 1911 has come to hand and is printed in the usual excellent typographical style. The frontispiece is an exterior view of the Engineers' Building, and the book contains as usual the constitution, by-laws, and a list of members. The standardization rules have been omitted this year, and a list of enrolled students has been added.

PROPOSALS.

ILLINOIS ELECTRICAL APPROPRIATIONS.—The State Board of Administration which has control of the seventeen charitable institutions has approved the following estimates, which according to custom probably will be provided for when the appropriations are asked from the legislature: Electric Wiring, Hospital for Insane, Elgin, $15,000; rewiring center building, Hospital for Insane, Jacksonville, $10,000; electric elevator, Hospital for Insane, Anna, $3,200; motor, wire insulators and pins, Watertown Hospital for Insane, $493; electric irons, Peoria Hospital for Insane, $1,000; rewiring main building, School for Girls, Geneva, $3,000. Z.

NAVY DEPARTMENT SUPPLIES.—The Bureau of Supplies and Accounts, Navy Department, Washington, D. C., will open bids on naval supplies on the dates given below. Bidders interested therein should make early application for copies of the schedule, giving the schedule numbers desired. Schedules can be obtained from the Navy Pay Office nearest each navy yard. Bids will be asked on the following supplies:

Date of Opening.	Material.	Quantity.	Place of Delivery.	Schedule No.
February 14—	Annunciators, fire alarm.	2.....	Norfolk, Va.	3302
	Cable, lighting, portable.	50,000 feet...	Brooklyn, N. Y.	3298
	Conductor, duplex, r. 1.	38,000 feet...	Brooklyn, N. Y.	3298
	Conductor, double braided	15,000 feet...	Brooklyn, N. Y.	3298
	Cord, lamp, silk covered.	30,000 feet...	Brooklyn, N. Y.	3298
	Wire, telephone, duplex.	10,000 feet...	Brooklyn, N. Y.	3298
February 21—	Telephones, switchboards, etc.	Miscellaneous.	Philadelphia	3314
	Ventilating sets	2.....	Brooklyn, N. Y.	3312
February 28—	Wireless-telegraph sets.	24 sets.....	Brooklyn, N. Y.	3307

NEW INCORPORATIONS.

LOUISVILLE, KY.—The Kentucky Electric Company has been incorporated with a capital of $3,000,000 by L. Jones, B. E. Hughes and A. J. Carroll.

CHICAGO, ILL.—The Kelso Electric Company has been incorporated with a capital stock of $1,000 by William E. Harper, Alexander O. Kelso and George Saumenweber.

CHICAGO, ILL.—The Independent Fixture Company has been chartered with a capital of $5,000 to manufacture gas and electric-light fixtures. The incorporators are: P. L. Utley, Ralph Utley and Elmer E. Challenger.

COLUMBUS, O.—The Avery-Loeb Electric Company has been incorporated to manufacture electric fixtures. The capital of the company is $25,000 and the incorporators are Oscar Avery, A. E. Loeb, C. W. Hammond, A. U. Loeb and A. L. Frey.

EUREKA, ILL.—The Electric Service System has been incorporated with capitalization of $40,000 to manufacture and furnish electrical power and deal in electrical goods. The incorporators are T. O. Tanton, Mary M. Whetzel and H. W. Bullock. Z.

ST. LOUIS, MO.—The International Electric Fixture and Contracting Company has been incorporated with a capital stock of $10,000, fully paid, to deal in electrical machinery. The incorporators are Oliver Shiras, Paul Brown, Jr., Robert Holmes, James P. Lombard and R. H. Robinson. Z.

BIRMINGHAM, ALA.—The Isherwood Chandelier and Manufacturing Company, Birmingham, Ala., has incorporated with an authorized capital stock of $10,000. The company will do a general manufacturing business in gas and electric fixtures. Headquarters will be established in Birmingham. The officers will be: W. S. Isherwood, president; L. W. Isherwood, vice-president; George L. Smith, secretary, and W. M. Isherwood, treasurer.

INDUSTRIAL ITEMS.

THE ROESSLER & HASSLACHER CHEMICAL COMPANY has distributed its January price list of chemicals.

THE EASTERN ELECTRIC LAMP COMPANY, Boston, Mass., has distributed calendars and blotters advertising Eastern Mazda lamps.

THE COLUMBIA METER COMPANY, Indianapolis, Ind., is mailing folders descriptive of its high-torque induction watt-hour meters.

THE GRAND LEDGE CLAY PRODUCT COMPANY, Grand Ledge, Mich., calls attention in a recent mailing slip to its multiple, single, round and square conduit for all uses. The factory of this company is the largest clay-conduit factory in the Central States.

PETTINGELL-ANDREWS COMPANY, Boston, Mass., has mailed to its customers sheets embodying correction to price list No. 1. In the future correction sheets will be sent with each number of June, and complete revised price lists will be issued quarterly.

THE HURLEY MACHINE COMPANY, Chicago, Ill., illustrates its washing machines in a recent booklet which has been sent to the trade. A set of six pictures showing the progress of an electric washing operation is a feature of the little bulletin. Machines of several types are described.

THE AMERICAN SHIP WINDLASS COMPANY, Providence, R. I., has sold eight Taylor stokers to the Springfield Street Railway Company. Each stoker is to be used under a 375-horsepower boiler. In addition to the elimination of smoke this company expects that the Taylor stokers will enable them to carry their entire load on one boiler room, whereas, at present they are operating two boiler rooms, one of which is hand-fired and the other stoker-fired.

THE REYNOLDS ELECTRIC FLASHER MANUFACTURING COMPANY, Chicago, is mailing to customers and others interested, Bulletin No. 3, describing two flashing effects. One of the flashers is used for script letter signs and the other for sign borders such as rockets, arrows, sparks, etc.

THE MOORE LIGHT COMPANY, Newark, N. J., describes its Moore light windows in a recent booklet. The company announces that recent improvements and changes in the valve have made shipping by express possible, a change which revolutionizes the business of the Moore Light Company.

THE CUTLER-HAMMER MANUFACTURING COMPANY, Milwaukee, Wis., illustrates its direct-current and alternating-current elevator controllers (Schureman types) in a recently published bulletin. Together with price lists and descriptions there are a number of illustrations and diagrams.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia, Pa., has published two bulletins, No. 129 and No. 130, on "Chloride Accumulator" installations. The former describes the storage-battery installation on the system of the New River and Pocohontas Consolidated Coal Company, and the other the installation for the Slate Belt Electric Street Railway Company.

THE MAIN ELECTRIC COMPANY, New York, N. Y., deals with the economy in maintenance of the Main intense flaming arc lamp in a recent bulletin. These lamps burn, with two sets of 600-millimeter electrodes, for thirty-eight hours on direct current or thirty-five hours on alternating current. Drawings of the lamp, and distribution curves are included in the bulletin.

THE ROME WIRE COMPANY, Rome, N. Y., has sent out post cards advertising bare and tinned copper wire, magnet annunciator wire and rubber-covered code and telephone wires. The card is decorated with an attractive illustration and has a calendar for the month of February. A folder sent by the company gives a table of the prices of copper from 1883 to 1911.

FAIRBANKS, MORSE & COMPANY, Chicago, have published a very interesting booklet entitled "Catechism on Direct Current Apparatus," giving in simple language definitions for electrical terms and describing the construction and uses of different electrical machines. As the title indicates this treatise is prepared in the form of a series of questions and answers. It was originally compiled for the use of salesmen only.

THE MINERALLAC ELECTRIC COMPANY and THE CHICAGO ELECTRIC METER COMPANY, makers of the Chicago printing attachment, Minerallac insulating compound and other specialties, have moved their offices and factory from 1004-1010 West Van Buren Street to 400 South Hoyne Avenue, corner of Van Buren Street, Chicago. The Company now occupies a three-story building with unexcelled facilities.

B. PARKS RUCKER, Charlotte, N. C., has published a booklet describing the Rucker automatic and non-automatic feeder voltage regulator. This is a type of voltage-regulating transformer which the bulletin states is new, although it has been used in the Piedmont Section of the Carolinas, where it is well and favorably known. In addition to the descriptions of the various types of transformers there are a number of illustrations in the publication.

THE AMERICAN ELECTRIC TELEPHONE COMPANY, Chicago, Ill., has filed a voluntary petition in bankruptcy in the United States District Court. The petition fixes the Company's liabilities at $597,014 and the assets at $396,823. The petition followed as the result of a judgment for $6,000 entered in court in favor of Russel Tucker and was gained on debenture bonds of the company. The bankruptcy proceedings may result in the reorganization of the Company.

THE MORRIS IRON COMPANY, New York, N. Y., has made arrangements to take over the business of the Elmer P. Morris Company, Frederick Iron Works, and the Montrose Iron Works. These companies have made a specialty of outdoor lighting fixtures. The present facilities of the company will be greatly enlarged and the general policies continued. Stocks will be carried at the factory and warehouse in New York City. The sales office is located at 86 West Street, New York City.

THE ELECTRICAL ENGINEERS' EQUIPMENT COMPANY, Chicago, manufacturers of power-house specialties, owing to the constantly increasing demand for its product, has just moved into larger and more commodious quarters. The Company now occupies the double three-story and basement building at No. 10 and No. 12 North Desplaines Street, where its offices and factory will be located. There will be 12,000 feet of floor space available, giving the Company every facility for promptly meeting the demand of its customers.

THE STAR EXPANSION BOLT COMPANY, Bayonne, N. J., was the victim of a recent fire which almost completely destroyed its Bayonne works, on January 20. The stock of manufactured merchandise, however, was but slightly damaged, and it reports that deliveries were resumed without interruption Monday, January 23. The general and executive offices of the concern are located at 147-

149 Cedar Street, New York, with branch offices and warehouses in Chicago, San Francisco, New Orleans, Montreal, Toronto and Winnipeg. This concern carries heavy stocks at all of its branch warehouses, from which points it can make immediate delivery in case of emergencies.

THE WESTERN ELECTRIC COMPANY has mailed to the trade bulletin No. 1117, describing central-battery wall and desk sets, together with their accessories, for meeting standard requirements. This is a companion to bulletin No. 1116, issued a short time ago, on standard magneto sets and accessories. This bulletin describes and illustrates central-battery telephone sets to meet every condition of service, except where special treatment is needed. For these special cases, such as for mines, railways, etc., separate bulletins have been issued describing especially designed apparatus. The newest bulletin contains thirty-two pages and is illustrated by many photographs and diagrams.

THE WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY has recently closed a contract with the Universal Portland Cement Company for motors to operate its No. 6 plant at Buffington, Ind. The motors will be of the "MS" mill type, having characteristics specially suitable for cement mill work, and they will operate on a three-phase, twenty-five-cycle, 440-volt circuit. The sizes range from five horsepower to 200 horsepower and the aggregate capacity is 11,500 horsepower. This plant will be the largest in the United States, having a daily capacity of approximately 12,000 barrels, and will be electrically operated throughout; the various drives being of the latest development for cement-mill work.

THE GENERAL ELECTRIC COMPANY, Schenectady, N. Y., has issued, among recent bulletins, one on the subject of direct-connected generating sets. These sets while originally designed to meet severe conditions of marine work, are also well adapted, and have been used extensively for both power and lighting in isolated plants, and as exciters for alternating-current generators in central-station work. The bulletin is No. 4804. Bulletin No. 4807 illustrates and describes small plant alternating-current switchboard panels. In Bulletin No. 4808 there is a detailed description of the high-speed electric railway connecting Washington, D. C., with Baltimore, Md. The Company's 4,500-volt oil-break switches are quite fully described in Bulletin No. 4809. The line of portable and stationary air-compressor sets are the subject of Bulletin No. 4810.

THE UNITED STATES ELECTRIC COMPANY, New York and Chicago, has issued its Bulletin No. 101 describing the Gill selectors for telegraph service. The bulletin, which is not a catalogue or price list, gives a sketch of the development of selective calling, particularly with regard to telegraph and railway uses. The selector is described and its operation explained. The illustrations include diagrams of circuits arranged for the selector to be operated in telegraph service in various ways as may be desired. The selector requires no extra battery and will work with the local battery usually employed. Furthermore, it will operate to call an office when the local battery is in so poor condition or the line in so bad adjustment that the sounder call is useless. The bulletin also describes the telegraph answer-back and the automatic calling keys, auxiliary apparatus designed to secure uniform calling and prompt answers. The equipment for selector outfits to operate under the various arrangements described is conveniently grouped and designated by code numbers.

BUSCH-SULZER BROTHERS DEISEL ENGINE COMPANY, St. Louis, Mo., has been organized by Adolphus Busch and was incorporated on January 26 with a capital stock of $2,100,000. The main business of the new corporation will be the building and selling of the Diesel oil engine, and in the near future it will erect the most modern and complete plant of its kind in the world at a cost of about $1,000,000. While it is not yet decided upon, it is expected that the plant will be located at St. Louis. Mr. Busch has long been interested in the Diesel engine and Rudolph Diesel, the inventor, will be one of the directors of the new company. It was through the old American Diesel Engine Company that the Diesel engine, now manufactured by Adolphus Bush, purchaser of American Diesel Engine Company, was brought to its present high state of efficiency. As the engine now is, the average daily record of every electrical plant using it shows a cost of generation of less than one-third of a cent per kilowatt hour, taking a cost basis of three cents per gallon for crude or fuel oil. Another feature of the present Diesel engine is that the difficulty of reversal has been overcome, and now a marine type has been developed which runs equally well in either direction, and is easily reversed. All of the submarine boats of the French navy are equipped with engines of this type, and other countries as well are using them. The new company will provide itself with an adequate engineering staff, which is to be in charge of Max Rotter, now chief engineer of the Allis-Chalmers Company. Mr. Rutter has *carte blanche* in the matter of selecting his engineering staff, and will surround himself with the best of the experts in this line of work. The officers of company are: President, Adolphus Busch; first vice-president, August A. Busch; second vice-president and general manager, James R. Harris. Directors are: Edward A. Faust, E. D. Meier, Robert Sulzer, Eugene Augert, Rudolph Diesel and Daniel N. Kirby.

DATES AHEAD.

National Independent Telephone Association. Annual convention, Chicago, Ill., February 8, 9 and 10.

Philadelphia Electric Show, Philadelphia, Pa., February 13-27.

Electric Jobbers' Association, French Lick Springs, Ind., February 15, 16 and 17.

American Institute of Electrical Engineers, Mid-year Convention, Schenectady, N. Y., and Pittsfield, Mass., February 14, 15 and 16.

Minnesota Electrical Association. Annual convention, St. Paul Hotel, St. Paul, Minn., March 14, 15 and 16.

Missouri Electric, Gas, Street Railway and Water Works Association. Annual meeting, St. Louis, Mo., April 13, 14 and 15

Iowa Electrical Association. Annual meeting, Davenport, Iowa, April 19, 20 and 21.

RECORD OF ELECTRICAL PATENTS.

Issued (United States Patent Office) January 24, 1911.

982,248. FLEXIBLE CONDUIT. Abraham E. Chernack, Boston, Mass., assignor to Chernack Circular Loom Company, Boston, Mass. Filed December 20, 1909. Consists of an inner layer of tubular fabric, a waterproof layer above this, two spiral strips of dense insulating material and an outer tubular fabric.

982,249. MACHINE FOR COVERING FLEXIBLE TUBING. Abraham E. Chernack, Boston, Mass. Filed April 4, 1910. Includes a mandrel over which the tubing passes during the covering process and means for moving the tubing along the mandrel.

982,253. OIL SWITCH. Sears B. Condit, Jr., Boston, Mass. Filed March 16, 1909. Comprises a normally closed oil pan circuit-opening means co-operating with the pan and switch to prevent the opening of the pan until operated to open the circuit and means then operable to permit the opening of the oil pan and inspection of the switch.

982,266. IMPEDANCE DEVICE. William R. Garton, Chicago, Ill. Filed November 11, 1907. The line wire is spirally coiled and about it is a conducting sheath connected to ground.

982,269. AMUSEMENT DEVICE. Albert C. Grunwald, Maywood, Ill. Filed September 12, 1910. An aeroplane carrying an electric motor is made to move between two sets of tracks.

982,274 to 982,276. PRINTING TELEGRAPH. Charles K. Jones, Kansas City, Mo. Filed September 2 and 14, 1909, and January 17, 1910. The selecting contacts are arranged in the form of a sunflower and control primary and secondary relays that actuate the printing magnets.

982,280. LIGHT ATTACHMENT FOR FIREARMS. Clifford A. Lewis, Portland, Ore., assignor of one-half to Myron E. Hill, Salida, Colo. Filed December 18, 1909. A tubular attachment for a firearm contains a reflector at one end, a lens at the other and an electric lamp near the reflector.

982,281. HIGH-TENSION-CURRENT PROTECTOR. Charles J. Lincoln and Edgar E. Weil, New Orleans, La. Filed July 8, 1908. Comprises a spark gap consisting of a pair of knife edges and a pair of needle points, one of the knife edges being adjustable.

982,284. SAFETY DYNAMIC BRAKING SYSTEM FOR HOISTS. John S. McKee, Pittsburg, Pa., and James F. Schnabel, New York, N. Y. Filed January 8, 1909. In connection with the controller for a reversing motor is an electromagnetic switch which short-circuits the armature of the motor when the switch is de-energized.

982,331. THERMOSTATIC DAMPER-CONTROLLING APPARATUS. Benjamin C. Wickes, Auburn, N. Y. Filed March 27, 1908. Renewed June 23, 1910. An electromagnetic control for a spring damper regulator is governed by a thermostat.

982,343. IGNITER FOR INTERNAL-COMBUSTION ENGINES AND ANALOGOUS PURPOSES. Henry W. Aylward, Brooklyn, N. Y. Filed April 1, 1907. A magneto with an adjustable core.

982,345. CANOPY-SWITCH. Reuben B. Benjamin, Chicago, Ill., assignor to Benjamin Electric Manufacturing Company, Chicago, Ill. Filed December 28, 1907. A rotating snap switch is inclosed in the canopy and operated by a pull cord through a pulley, ratchet and pawl.

982,346. ELECTRICALLY-OPERATED AUTOMATIC CUT-OUT. Peabody A. Brown, Denver, Colo. Filed December 20, 1909. A pair of coaxial solenoids has a reciprocating armature by which is moved a circuit-opening and closing slide bar.

982,352. ELECTRIC SIGN. Arthur V. Diehl, Englewood, N. J. Filed December 31, 1909. To two vertical contact bars are adjustably connected pairs of horizontal parallel contact strips between which the letters are secured and with which they make electrical contact.

982,362. MOTOR-CONTROLLER. Clark T. Henderson, Milwaukee, Wis. Filed May 14, 1910. A hoisting motor is automatically started when the load attains a certain weight and automatically stopped when the load is raised a certain distance. It is then reversed in the same way.

982,365. MOTOR-CONTROLLING DEVICE. Albert J. Horton, White Plains, N. Y., assignor to Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed June 1, 1909. A resistance-controlling contact arm sweeps over a series of contacts under pneumatic control.

982,367. MACHINE FOR GRINDING COMMUTATORS OF DYNAMOS AND MOTORS. William H. Jordan, Brooklyn, N. Y., assignor to Jordan Brothers. Filed May 6, 1908. A frame supporting a shaft and grinding wheel is mounted on the main bearing of the machine to be operated on. The grinding shaft is driven through a flexible connection.

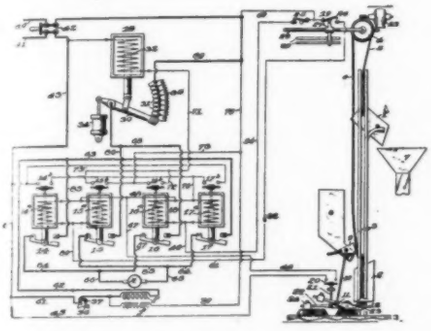
982,377. DYNAMO-ELECTRIC MACHINE FOR MAINTAINING A CONSTANT ELECTROMOTIVE FORCE UNDER VARIATION OF SPEED. Matthew William Walbank Mackie, Ealing, England. Filed August 24, 1906. In combination with a work circuit and a multipolar dynamo having a magnetizing winding on all its poles is a demagnetizing winding on some only of the poles, an accumulator in series with the demagnetizing winding simultaneously supplying the work circuit and acting in opposition to the voltage of the dynamo through this winding, and a similar accumulator directly connected across the armature to enable it to be charged at the required voltage of the machine while the other is discharging at a lower voltage.

982,493. ELECTROLYTIC CELL. Arthur S. Hickley, Manasquan, N. J., assignor to Como Electrical Company. Filed November 25, 1907. The combination of a cell and a transformer and means whereby the heat developed in the core of the transformer is used for warming the electrolytic cell.

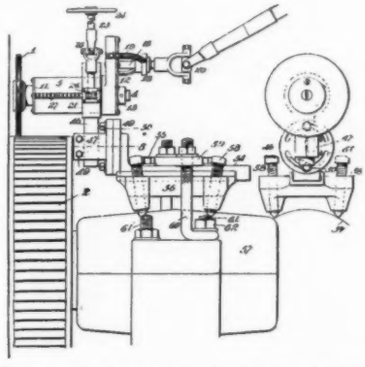
982,494. ELECTROLYTIC ALTERNATING-CURRENT RECTIFIER. Arthur S. Hickley, Manasquan, N. J., assignor to Como Electrical Company. Filed June 26, 1908. Combined with electrolytic elements connected in opposition and a circuit provided with translating devices bridging elements of like polarity are means for making and breaking the circuit.

982,495. ELECTRIC TIME-ALARM FOR HOTELS, ETC. George M. Hinman, Lindsay, Cal. Filed December 16, 1909. Includes a main circuit-closing clock connected to auxiliary dials through the alarm and battery circuits.

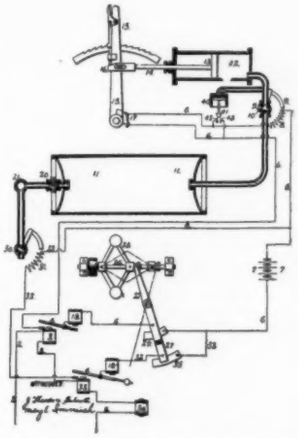
982,499. SPEED-INDICATING SYSTEM. Miller Reese Hutchison, Summit, N. J. Filed September 17, 1909. The method of determining speed or rates of work of an apparatus, both when driven forward and when reversed, consists in generating by induction alternating voltages proportional to the speed of such apparatus and in phase when the apparatus is driven in one direction, and out of phase when the apparatus is driven in the other direction, and compounding and measuring the voltages or currents of each set.



982,362.—MOTOR CONTROLLER.



982,367.—COMMUTATOR GRINDING OUTFIT.



982,611.—TRAIN CONTROL SYSTEM.

982,380. ELECTRIC-POLE STAND. David A. Martin, Republic, Wash. Filed January 24, 1910. A sheath for the pole is permanently set in the ground and has a clamping collar about its split upper end.

982,407. ELECTRODE FOR FLAMING ARC LAMPS. Miner W. Allen and Wallace T. Conn, Lakewood, Ohio, assignors to National Carbon Company, Cleveland, Ohio. Filed April 23, 1909. Has a wire extended through it from end to end and projected from the top, the projecting end being connected both mechanically and electrically to a metallic coating on the upper end of the electrode.

982,419. ELECTRICALLY-OPERATED ORGAN. William B. Fleming, Los Angeles, Cal. Filed January 24, 1902. The great organ has a great wind box which is connected to the minor organs electrically. Contacts are closed on the exhaustion of the pneumatics and opened on their reinflation.

982,420. ELECTRIC FURNACE. Carl Fredrik Jakob Forssell, Cleveland, Ohio, assignor to National Carbon Company. Filed July 20, 1908. A resistance furnace having a tubular body with a wall of resistance material.

982,450. TELEPHONIC INSTRUMENT. Samuel L. Van Akin, Jr., Liverpool, N. Y. Filed March 10, 1908. A swiveling telephone support contains switch operated by the turning of the support and carries a receiver and transmitter in proper position for immediate use.

982,462. ELECTRIC INCUBATOR AND NURSERY. Adolf Beckstrom, Lewistown, Mont. Filed March 11, 1909. Contains an electric heater controlled by a thermostatic device.

982,470. ELECTRIC LAMP. James Oscar Camp, Jr., Jacksonville, Ala. Filed July 26, 1910. A double-filament incandescent lamp has one common terminal for the two filaments and separate terminals on the other end thereof. A limited longitudinal movement of the base by means of a rack and pinion connects either filament.

982,473. SPARKER FOR EXPLOSIVE ENGINES. Earl Canedy, Chicago Heights, Ill. Filed February 8, 1905. Relates to details of construction of a spark plug.

982,474. SPARK-PLUG. Earl Canedy, Chicago Heights, Ill. Filed March 16, 1905. A modification of the above.

982,503. INCUBATOR-ALARM. William M. Kelly, Herkimer, N. Y. Filed July 1, 1909. An electric heat alarm controlled by the movement of a plunger.

982,519. AUTOMATIC SAFETY DEVICE FOR ELEVATORS. Henry P. May, Kansas City, Mo., assignor to H. A. Stevens, J. W. Stephens and H. S. Julian, Kansas City, Mo. Filed December 26, 1908. The motor circuit of the elevator is closed by the elevator gates, so that when any gate is open the elevator cannot be operated.

982,535. OUTLET-BOX. Clarence Rudkiewicz, Detroit, Mich. Filed August 8, 1910. An outlet box comprises a wall formed with a circular opening having a plurality of laterally extending notches, a tubular socket member adapted to receive a pipe at its outer end and having a reduced inner end to fit the opening and forming a shoulder to engage the outer face of the wall.

982,536. SAFETY APPLIANCE FOR ELEVATORS. Henry W. Sayles, Peoria, Ill., assignor of one-third to Herva I. Waggoner, Peoria, Ill. Filed April 22, 1910. A vertical weighted cable connected to a circuit-breaker in the motor circuit passes all the doors of the elevator. When all doors are closed the circuit-breaker is pulled shut but in the event of any door being open the circuit-breaker is opened by the weight.

982,546. LOCK-OUT PARTY-LINE TELEPHONE SYSTEM. Albert Swenson, Willmar, Minn. Filed March 22, 1907. Means are provided whereby an operation at one of the telephones will lock out of listening communication all other telephones, except the telephone with which communication is desired, in combination with means whereby the telephones locked out of listening communication may be connected into speaking communication with the two connected telephones.

982,549. ROTARY SNAP-SWITCH. George B. Thomas, Bridgeport, Conn., assignor to Perkins Electric Switch Manufacturing Company, Bridgeport, Conn. Filed August 14, 1908. A rotary snap switch, having a base and stops with an operating spindle carrying a crank arm, a latch bar pivoted to the crank arm, and adapted to engage the stops, a switch plate with which the latch bar is in sliding engagement and a tensioning spring between the spindle and switch plate.

982,551. EXCESSIVE-ELECTRICAL-CURRENT ARRESTER. Marion E. Vaughn, Plainfield, Ind. Filed August 9, 1909. Includes

a main conducting wire, a carbon block on each side of it, insulation between the carbon blocks and wire so as to space the blocks from the wire, means for clamping the blocks and insulation to the wire, and a ground wire running from one of the carbon blocks to the ground.

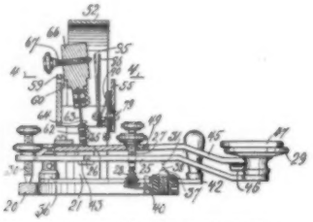
982,522. X-RAY TUBE. Harry F. Waite, New York, N. Y. Filed January 25, 1906. Renewed May 13, 1910. Includes a secondary tube, a target in the main tube and one in the secondary tube, also a screen between one electrode and the target.

982,557. REINFORCED GRID RESISTANCE. Henry J. Wiegand, Milwaukee, Wis., assignor to Cutler-Hammer Manufacturing Company, Milwaukee, Wis. Filed May 4, 1908. A grid resistance is reinforced with U-shaped strips having transversely-extending ribs.

982,563. TERMINAL OR LUG FOR ELECTRICAL CONDUCTORS. Chester R. Baird, New York, N. Y. Filed March 19, 1910. The lug is provided with threads for making the electrical connection, and with a tapered chamber for engaging with the insulation.

982,576. BATTERY. Harry William Darby, Winnipeg, Manitoba, Canada. Filed March 31, 1910. A V-shaped receptacle contains a V-shaped zinc electrode having its lower end dipped in mercury, a carbon electrode being located on the upwardly projecting portion of the casing, this electrode being porous and containing one of the electrolytes, and an open ended porous insulator between the carbon and zinc electrodes, and resting on the projecting portion of the casing, the other electrolyte being between the carbon electrode and the casing.

982,587. APPARATUS FOR PRODUCING AND UTILIZING ELECTRICAL EFFLUVIA. Leon Gerard, Brussels, Belgium, assignor to Gerard Ozone Process Company. Filed August 1, 1907. An apparatus for producing ozone from the oxygen of the air.



982,637.—TELEGRAPH KEY.

982,611. AUTOMATIC TRAIN-CONTROLLING MECHANISM. Niels Lang, Vancouver, British Columbia, Canada. Filed March 16, 1909. The air valves of the train-controlling mechanism are operated by a set of electric relays.

982,638. TELEGRAPHIC DOT-TRANSMITTER. Harry H. Smith, Brooklyn, N. Y. Filed June 22, 1910. A vertical vibrator over the regular telegraph key consecutively opens and closes the electric circuit for specified intervals of time.

982,641. TELEPHONE MOUTHPIECE. Louis Steinberger, New York, N. Y. Filed June 20, 1910. The mouthpiece is so shaped that a legend plate may be securely clamped to it and held in position.

982,651. PORTABLE ELECTRIC HAND-LAMP. Harlan P. Wellman, Ashland, Ky. Filed May 19, 1910. Has a hollow handle so that the plug and cord may be inclosed in it when the lamp is not in use.

982,659. SYSTEM OF TELEGRAPHY. Robert L. Dean, Kansas City, Mo., assignor to Dean Rapid Telegraph Company. Filed February 1, 1908. Comprises a line wire, sources for supplying the same with positive and negative impulses, contact levers for controlling the duration of the impulses, embossed material for actuating the contact levers, reciprocable character-bearing members, electromagnets for actuating these, and a polarized relay in circuit with the electromagnets to control them, said polarized relay being controlled by the positive and negative impulses.

982,693. INCANDESCENT-LAMP SOCKET. Frank E. Seeley, Bridgeport, Conn., assignor to Bryant Electric Company, Bridgeport, Conn. Filed May 25, 1908. A pull socket has a spindle carrying a contact piece, a ratchet for actuating the spindle and means for securing a pull chain.

982,695. INDUCTIVE-MOTOR CONTROL. August Sundh, Yonkers, N. Y., assignor to Otis Elevator Company, Jersey City, N. J. Filed June 27, 1907. An alternating-current motor has an impedance coil in its circuit, a magnetic core movable into and out of the coil, and means for exerting a yielding outward pull on the core which is balanced by the magnetic pull of the coil on the core when the motor circuit is excited, this coil and its core being designed to control the speed of the motor by the variation of the impedance in the coil.

982,729. POROUS-CUP ELECTRODE. Pierre J. Kamperdyke, New York, N. Y. Filed November 9, 1907. Renewed May 20, 1910. A separating wall composed of a dense substantially non-porous material forms an electrode for two fluid cells. The wall has a form presenting many small areas rendering it substantially permeable to the electrolyte.

982,735. ELECTRICAL RESISTANCE. James F. McElroy, Albany, N. Y., assignor to Consolidated Car Heating Company. Filed May 18, 1910. A resistance is made with a rigid support combined with a fine wire wound on a comparatively soft cord of insulating material.

982,738. INCLOSED FUSE. Charles R. Moellendorf, Seattle, Wash. Filed July 18, 1910. The fusible element is detachably connected to the cap elements of the fuse.

982,751. GLOWER FOR ELECTRICAL INCANDESCENT LAMPS. Orlando M. Thowless, Newark, N. J. Filed May 1, 1908. Consists of a light-emitting body composed of tungsten and refractory oxide covered with refractory metal.

982,764. ELECTRIC-CONDUCTOR MOLDING. Sidney M. Burk, Philadelphia, Pa., assignor to Improved Moulding Manufacturing Company, Philadelphia, Pa. Filed December 9, 1907. Has a channel provided at intervals with relatively short undercut sections and with relatively short slots adjacent to the undercut sections.

PATENTS THAT HAVE EXPIRED.

Following is a list of the electrical patents (issued by the United States Patent Office) that expired January 30, 1911:

513,482. ANTINDUCTIVE CONDUCTOR. Horace F. Chick, Watertown, Mass.

513,507. UTILIZING ELECTRIC MOTORS FOR OPERATING MACHINERY. Carl Hoffman and Ernst Richter, Berlin, Germany.

513,526. FIRE-ALARM TELEGRAPH SYSTEM. Michael J. O'Sullivan, Baltimore, Md.

513,533. COMMUTATOR. George A. Rollins, Chicago, Ill.

513,534. SIGNALING SYSTEM FOR TELEPHONE CIRCUITS. John I. Sabin and William Hampton, San Francisco, Cal.

513,537. SIGNALING SYSTEM FOR TELEPHONE TRUNK-LINES. Charles E. Scribner, Chicago, Ill.

513,545. CIRCUIT-CONTROLLER FOR REGULATORS. Barton B. Ward, New York, N. Y.

513,564. ELECTRIC-WIRE CLEAT OR HOLDER. Albert W. Fuller, Saugus, Mass.

513,587. ELECTRO-MECHANICAL DEVICE FOR BELLS, ETC. William O. Meissner, Chicago, Ill.

513,592. ANNUNCIATOR. Joseph H. McEvoy, Waterbury, Conn.

513,593. ELECTRIC BELL. Joseph H. McEvoy, Waterbury, Conn.

513,598. STARTER AND PROPELLER FOR ELECTRIC CARS. Ernest Schmidt and James Mendenhall, Chicago, Ill.

513,599. GEARING FOR ELECTRIC LOCOMOTIVES. George W. Swartz, Florence, Ala.

513,602. ELECTRIC FURNACE. Elihu Thomson, Lynn, Mass.

513,611. DYNAMO-BRUSH. Wilfred H. Fleming, Bayonne, N. J.

513,612. ELECTRICAL REGISTERING DEVICE. Friedrich von Hefner-Alteneck, Berlin, Germany.

513,615. METHOD OF OPERATING ELECTRIC LOOM-SHUTTLES. Levi W. Lombard, Saco, Me.

513,626. AUTOMATIC RHEOSTAT. Carson J. Sturgeon, Erie, Pa.

513,630. DETACHABLE ELECTRIC-WIRE-HOLDING DEVICE. Cornelius Beard, Brookline, Mass.

513,720. TELEPHONE. Herbert S. Page, Somerville, Mass.

513,725. ELECTRIC ARC LAMP. Frank A. Perret, Brooklyn, N. Y.

513,729 and 513,730. TELEPHONE TRANSMITTER. Francis H. Richards, Hartford, Conn.

513,775. ANNUNCIATOR. Manious Gari, Akron, O.

513,777. ELECTRIC CONNECTION FOR RAILWAY RAILS. Alfred Green, Rochester, N. Y.

513,796. AUTOMATIC CIRCUIT-CLOSER. Henry Lewers, Carson City, Nev.

513,806. STOCK FEEDING AND HOUSING DEVICE. Oscar W. Mapes, Middletown, N. Y.

513,829. ELECTRIC ALARM. David S. Schureman, Rockford, Ill.

513,839. SYSTEM OF ELECTRICAL DISTRIBUTION. Charles H. Talmage, St. Louis, Mo.

513,850. ELECTRICAL THEATRICAL APPLIANCE. Henry E. Waite, New York, N. Y.

513,859. ELECTRICALLY-PROPELLED DRIVE-WHEEL. Carl G. Anderson, Lynn, Mass.

513,894. SECTIONAL ELECTRIC RAILWAY. George W. Demmick, Lynn, Mass.

513,895. POWER-TRANSMITTING MECHANISM FOR ELECTRIC LOCOMOTIVES. Mark W. Dewey, Syracuse, N. Y.

513,910. STORAGE BATTERY. George B. Fraley, San Francisco, Cal.

513,921. ELECTRIC ARC LAMP. Manuel R. Guiterrez and Milton T. Thompson, Jalapa, Mex.

513,948. AUTOMATIC DAMPER-REGULATOR. Hosea F. Maxim, Norfolk, Va.

513,949. CONNECTOR FOR ELECTRIC WIRES. Edward H. Munson, New Britain, Conn.

513,956. ANNUNCIATOR. Frederick W. Ross, Boston, Mass.

513,960. AUTOMATIC TELEPHONE SWITCH. Augustus C. Wheat, Chicago, Ill.

11,400. SYSTEM OF ELECTRICAL DISTRIBUTION. William Stanley, Jr., and John F. Kelly, Pittsfield, Mass. (Reissue).